



THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্ৰাপ্ত কৰ্তৃত্বৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

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No. 57 Dispur, Saturday, 3rd February, 2024, 14th Magha, 1945 (S. E.)

GOVERNMENT OF ASSAM

ORDERS BY THE GOVERNOR

GUWAHATI METROPOLITAN DEVELOPMENT AUTHORITY

NOTIFICATION

The 9th January, 2024

No. GMDA/GEN/11/2020/Pt-1/25.- In exercise of the powers conferred by sub-section (1) of Section 20 of the GMDA Act 1985, (as amended) the Guwahati Metropolitan Development Authority is pleased to publish the following Notice regarding the publication of the new draft GIS Based Master Plan 2045 for existing Guwahati Metropolitan Area.

NOTICE FOR THE PUBLICATION OF THE DRAFT GIS BASED MASTER PLAN 2045 AND THE ZONING REGULATIONS FOR THE EXISTING GUWAHATI METROPOLITAN AREA.

1. It is notified that the new draft Master Plan and Zoning Regulation for the existing Guwahati Metropolitan Area, prepared under Section 16 of GMDA Act 1985 (as amended) for the areas described in the schedule below, is hereby published.
2. Any person or persons affected by the draft Master Plan 2045 and the Zoning Regulations therein may submit their objection or suggestion in writing to the Chief Executive Officer, Guwahati Metropolitan Development Authority and also in official email: masterplan.gmda@gmail.com within 1 (one) month from the date of publication of this Notification.
3. The draft Master Plan and the Zoning Regulation together with all relevant reports and maps may be inspected free of cost during office hours on all working days at the offices of The Chief Executive Officer, Guwahati Metropolitan Development Authority, Bhangagarh, Guwahati 05 and the soft copy of the Draft Master Plan is also uploaded and available in www.gmda.assam.gov.in for public inspection.
4. This notification is issued in pursuance to Government approval vide ecf No.429544/968 dated 08.01.2024

Schedule of Area**A. SITUATION AND AREA: -**

1. Districts : Kamrup (Metro) and Kamrup
2. Approximate Total Area: 328 sq. km.

Revenue Circle, Mouzas and Villages included in the existing Master Plan for Guwahati Metropolitan Area:

Circle Office	Mouza	Village
Guwahati Circle	Ulubari	Sahar ulubari-1st Part, Sahar ulubari-2nd Part, Sahar ulubari-3rd Part, Sahar Sarania-1st part, Sahar Sarania-2nd part, Sahar Bamunimaidam, Bamunimaidam Gaon, Nunmati Gaon, Ulubari, Ramcha Hill Grant, Sunsali Grant, Sahar Kharghuli, Clearance Grant
	Guwahati	Sahar Guwahati-1st Part, Sahar Guwahati-2nd Part, Sahar Guwahati-3rd Part, Sahar Guwahati-4th Part, Sahar Guwahati-5th Part, Sahar Guwahati-6th Part, Sahar Guwahati-7th Part, Sahar Guwahati-8th Part
	Jalukbari	Dehangari Gaon, Kacharigari Gaon, Pachim Jalukbari, Dakhin Jalukbari, Maj Jalukbari, Uttar Jalukbari, Sadilapur, Tetelia, 2 No. Tetelia, Pachim boragaon, Pub Boragaon, Pub Boragaon 2 No., Pachim Boragaon 2 No., Gotanagar, Gotanagar N.C., Maligaon, Maligaon N.C., Durgasarobar N.C., Durgasarobar Gaon, Fatasil 2 No., Kamakhya, Gorpandu Kumar Para, Bharalumukh Gaon, Sahar Bharalumukh
Dispur Circle	Beltola	Betkuchi, Jutikuchi, Fatasilgaon, Barsapara, 3 No. Kahilipara, Odalbakra 2 No., Odalbakra Gaon, Dakhingaoon, Saukuchi, Sarusajai, Barsajai, Natbama, Hatigaon, Jatia, Kahilipara Gaon, Kahilipara 1 No., Kahilipara 2 No., Dispur, Dispur 2 No., Bhagargaon Grant, Japorigog 1 No., Japorigog 2 No., Hengrabari (1 no. Hengrabari), Geetanagar, Hengrabari Gaon, Sarumataria, Rukmini Gaon, Barmataria, Khanapara, 2 No. Khanapara, Maidam 1 No., Maidam 2 No., Basistha Mandir, Basistha Grant, Basistha Gaon, Duwarandha, Bagharbari, Bagharbari 2 No., Satgaon, Birkuchi N.C., Kalitakuchi, Kalitakuchi N.C., Madgharia 3 No., Madgharia No. 1, Madgharia No. 2, Noonmati Garden, Bonda Grant -I, Bonda Grant -II, Kharghuli Gaon, Kharghuli N.C, Jansimalu, Jansimalu N.C., Dhalbama
North Guwahati Circle	Silasundurighopa	North Guwahati 1st to 6th Part, Rudreswar, Gouripur, Abhaypur, Tiling Gaon, SilaMahekhaite, Ghorajan, Numaligarh, Amingaon, Silagaon part, Jalahgaon, Balai Beel, Bamun Gaon, Fulung, Rang Mahal, Chang Chari Part
	Barbangsar	Barchandra, Barchandra Grant

Hajo Circle	Pub Bangsar	Chormajuli Pam, Charmajuli Gaon, Dalibari, No.1 Singimari, No.2 Singimari, No.3 Singimari, Rawmari, Niz-Gondhmou, Kismat Bangsar, Ambari, NijBangsar, Rakhakhinir Char, Bamunbari
Azara Circle	Dakhinrani	Barjhar, Kahikuchi, Jugipara, Jabe, Patgaon Pt, Matikuturi, Paseniapara, Jangalipara, Deor Ali Gaon, Kamargaon
	Ramcharani	Kendukuchi, Majirgaon (CT) Pt, Agcia Pt, Garal Gaon, Azara Gaon, Dharapur, Upar Mirzapur, Mikirpara Chakordoi, Pamohi
Palashbari Circle	Chayani	Kaithasiddhi, Shathikorpa Pt, Maliata Pt, Losana, Salesala Pt, Bongra Pt., Kamargaon Pt.
	Dakhinrani	Sajan Para Pt., Rajapanichanda pt., Andherijuli Pt., Rangapara Pt., Kachari Ali Bari, Batabari, Bahupara Pt.
Chandrapur Circle	Beltola	Bonda Gaon

ANBAMUTHAN MP,
Chief Executive Officer,
Guwahati Metropolitan Development Authority.

1. INTRODUCTION TO MASTER PLAN AREA

1.1 Regional Setting

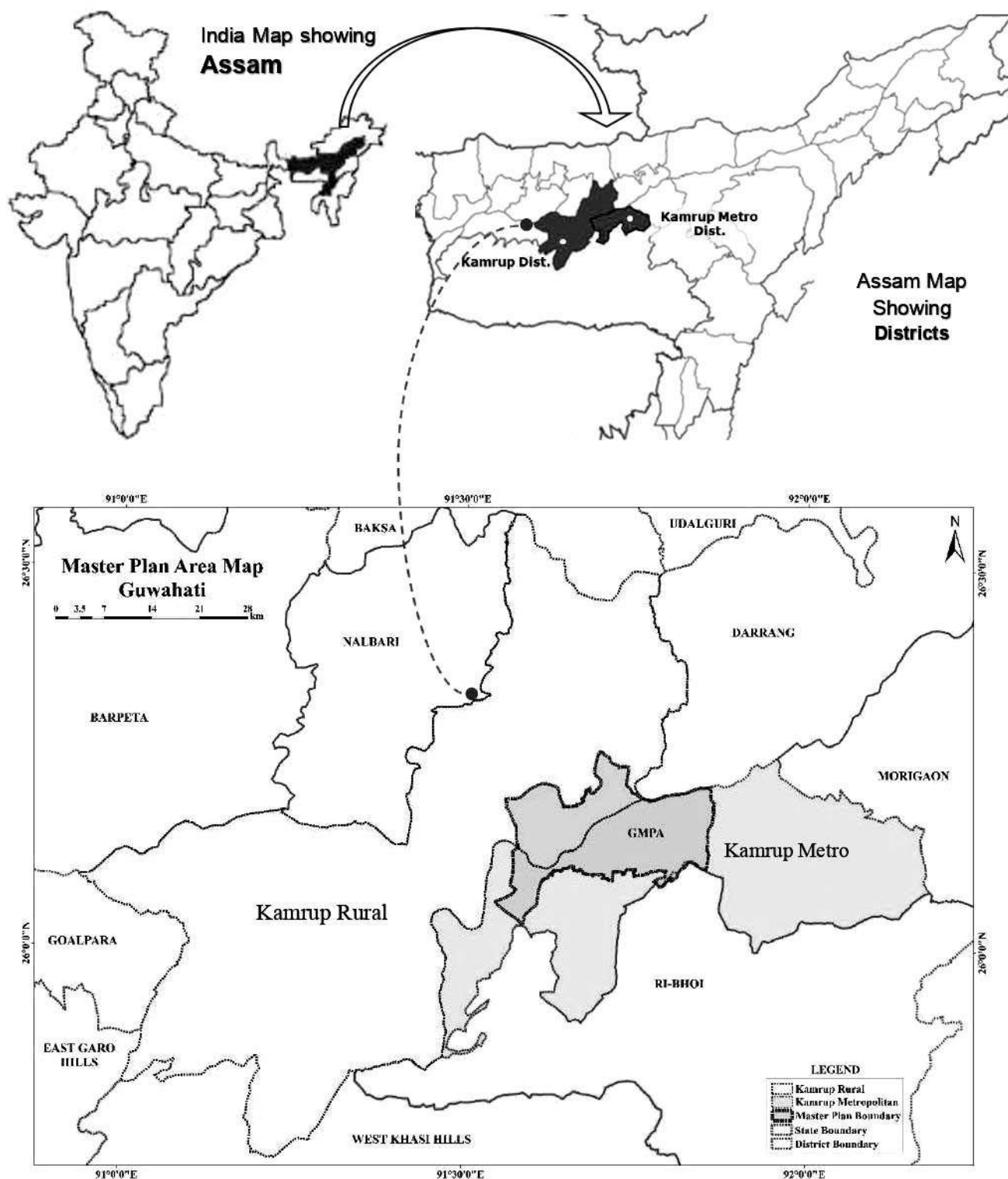


Figure 1-1 Location Map

1.1.1 Assam – As a State

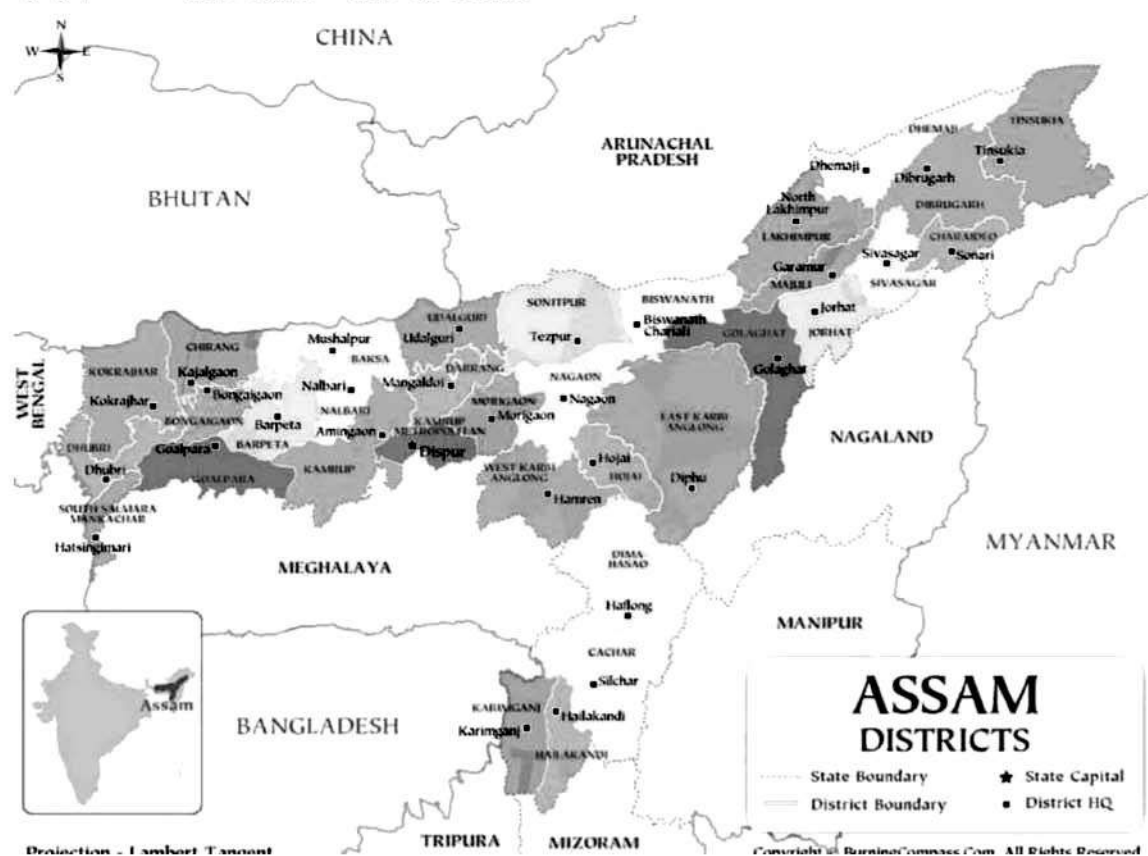


Figure 1-2 Map showing Neighbour States and District Headquarters of Assam

Assam state, situated in the northeast region of India, is surrounded by other six northeast states and is the second largest state among the seven sister states of North-Eastern Region of India. With a geographical area of about 78, 438 sq. kms, Assam accounts for one-third of the area of the North-Eastern region and 2.4 percent of the area of the country. Northeast India is ethnically distinct from the other regions of India. Linguistically the region is distinguished by a preponderance of Tibeto-Burman languages. The region is known for its unique culture, handicrafts, martial arts, and scenic beauty. The range of communities along with geographical and ecological diversity makes the northeast region quite different from other parts of the country.

The State has varied landforms, diverse flora and fauna and unique cultural traditions. Assam has a generally humid climate with a pleasant and long winter and brief summer. Temperatures vary from 18⁰ C to 35⁰ C in summer and from 7⁰ C to 26⁰ C in winter. Rainfall is heavy during the monsoon season from June to September and the average heavy rainfall is around 2400 mm. The best tourist season is October to April covering both winter and spring.

The economy of Assam is largely dependent on the rivers Brahmaputra and Barak along with their tributaries. The river Brahmaputra, which is the largest river in India, flows through the entire length of the State. Both the rivers, while nourishing the state and aids its economic development, also cause much havoc during monsoons. The hills running east to west divide Assam into two distinct valleys – Brahmaputra and Barak Valleys. The Barail Mountain ranges as well as Rengma and Kambi hills lie between the valleys.

Assam is a State of breath-taking scenic beauty. Its rolling hills, dense forests, green valleys, large waterways and rich biodiversity make Assam one of the splendid tourist destinations in the world. The State is also having unique art and culture, fairs and festivals, temples and monuments and handicrafts and handlooms. Forests cover almost one-fourth of the geographical area of the state. These forests, apart from being the home of a variety of animal and plant species and active biospheres, also provide excellent opportunities for nature tourism, wildlife and bird watching, jungle safaris and trekking. Assam has the rare distinction of possessing world natural heritage sites and beautiful national parks, tiger reserves and wildlife sanctuaries. There are five national parks and eleven wildlife sanctuaries in the state. Assam is a natural conglomeration of various ethnic tribes and groups, each having a distinct language, culture, songs, dances, and festivals. Rongali Bihu festival, tea tourism festival, Brahmaputra beach festival, etc. are being organized in the state as tourism events.

1.1.2 Kamrup and Kamrup Metro District

The Present Assam was referred to as Kamrup in many of the ancient Indian literature. It was also known as Pragjyotishpur due to the astrology (Jyotish Shashtra) practices that prevailed in this part of the country during that time. However, "Kamrup" became a more predominant name in the later part of the history. There is a famous story which says the reason behind the naming of this place "Kamrup".

Kamrup district was formatted in year 1945. District is located between 94°33'46" E to 95°29'8" E Longitude and 27°05'38" N to 27°42'30" N Latitude. Kamrup District covers area of approx. 1346.26 sq. miles (3486.6 sq. km) and comprises the population of 12,53,938 (as per Census 2011). This district has two Sub-Divisions- Kamrup Sadar and Rangia Civil Sub-Division. The Kamrup (Sadar) Sub-Division has 8 (eight) Revenue Circles and Rangia Civil Sub-Division has 3(three) Revenue Circles.

There is total 15 (fifteen) development Blocks in Kamrup district, out of which 11(eleven) development Blocks are under Kamrup (Sadar) Sub-Division and 4(four) are under Rangia (Civil) Sub-Division. This district has two municipality Rangia & Palasbari. (Source: DDMA Report, Kamrup)

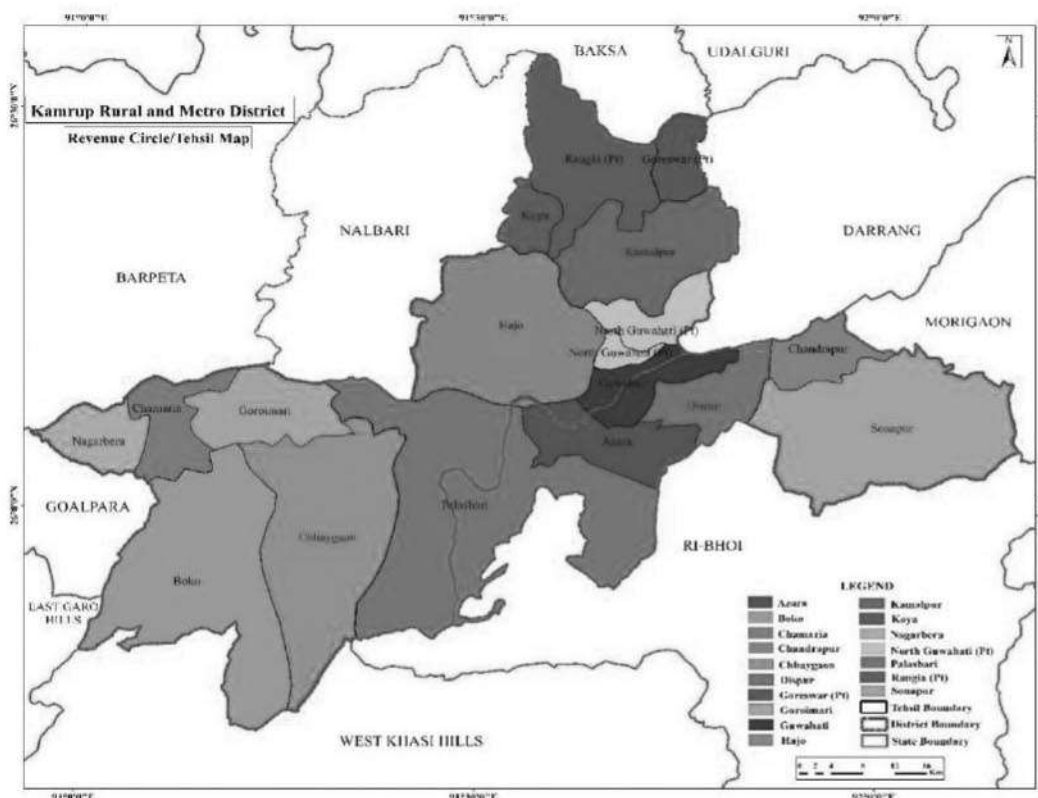
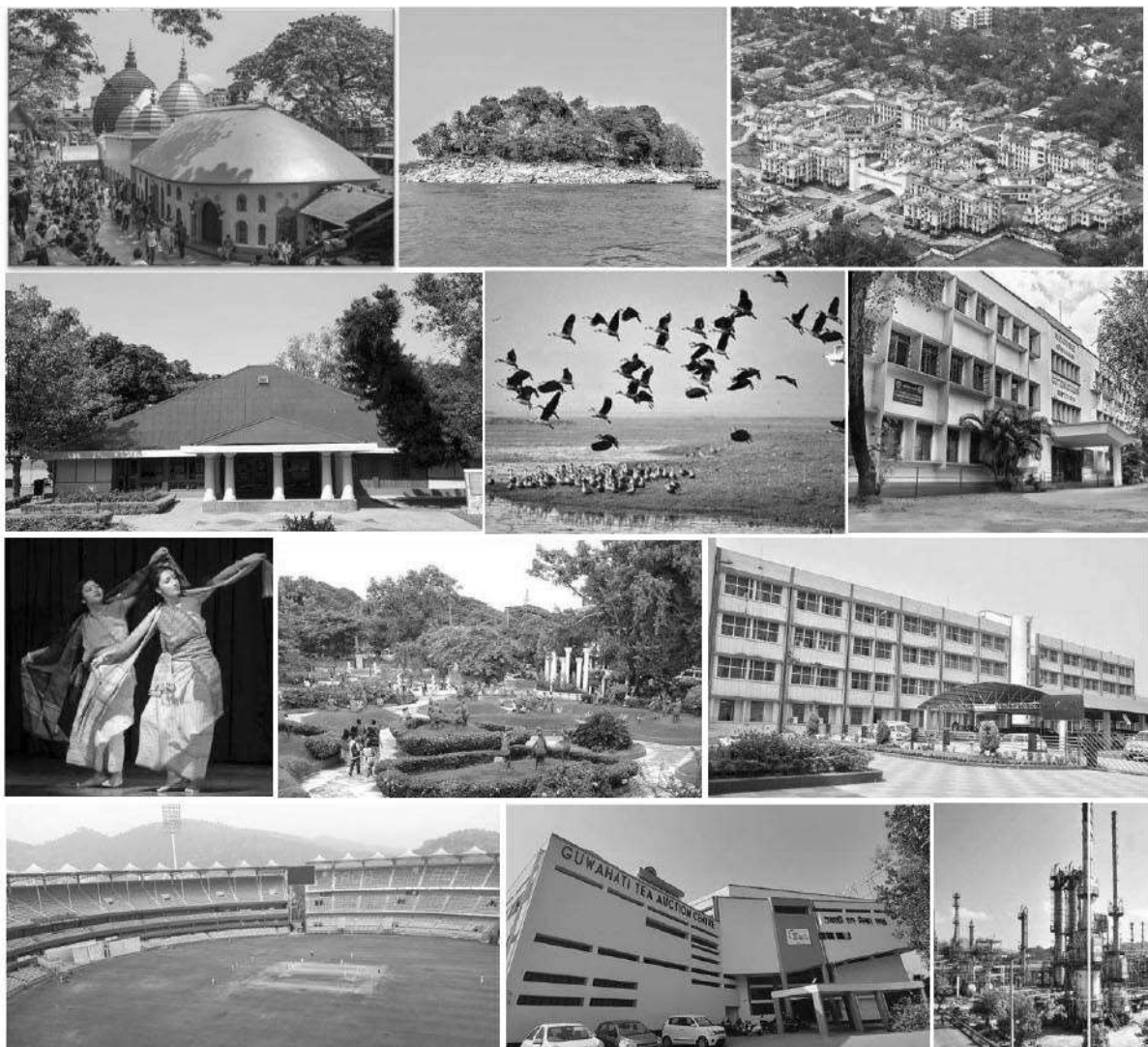


Figure 1-3 Kamrup rural and metro district

Kamrup Metro district was created bifurcating the old Kamrup district on 3rd February' 2003. Kamrup Metropolitan District is the capital district of Assam. It comprises of only one sub-divisions namely, Guwahati sadar sub-division. The City Guwahati is the Head Quarter of the District. Kamrup Metro occupies an area of 644 sq. km where Area under GMA is 264 sq. Kms with population of 968549 nos. (Census 2011). Kamrup metro covers area of 1528 sq.km and residing total population 2,60,419 (as per 2011 Census). Kamrup metro has total 5 no. of Revenue Circles and total 316 no. of villages. Presently, Kamrup Metro comprises total 30 no. of GMC wards but the entire analysis has been conducted as per earlier 60 ward system according to the data of Census of India. As an entire district it has one Sub-Division- Kamrup Metropolitan Sadar Sub-Division. The Kamrup Metropolitan District has 5 (Five) Revenue Circles viz. Sonapur RC, Guwahati RC, Azara RC, Chandrapur RC, Dispur RC. There are total 3 (three) development Blocks in Kamrup Metropolitan District, i.e., Chandrapur, Dimoria, Rani. (Source: DDMA Report, Kamrup)

1.1.3 Guwahati City

Cradled on the bank of Brahmaputra, 182.1 ft above sea level, Guwahati derives its name from 'Guwa' (fermented areca nut) and 'hati' (locality) though some go by 'haat' (marketplace). Guwahati is believed India's oldest surviving city after Varanasi in Uttar Pradesh, it was the capital of the Kamarupa kingdom in its earlier avatar as Pragjyotishpura or City of Oriental Astrology. It was also called Durjeya (impregnable).



A major riverine port city along with hills, and one of the fastest growing¹ cities in India, Guwahati is the gateway to the entire north-east India and the largest Metropolis with regard to the area and population. It houses "Dispur", the capital of Assam, is in the circuit city region located within Guwahati and is the seat of the Government of Assam. Guwahati, with its cardinal points as 26°10' North latitude and 92°49' East longitude is

¹ Choudhury, Rekha (31 December 2010). "Floating population in Guwahati and its impact on the city's environment", Gauhati University

situated on the southern bank of River Brahmaputra. It is located towards the south-eastern side of Kamrup district surrounded by Nalbari district in the north, Darrang, and Morigaon districts in the east, Meghalaya State in the south and Goalpara and Barpeta districts in the west. The city is situated on an undulating plain with varying altitudes of 49.5 mt to 55.5 mt above Mean Sea Level (MSL) which is dotted by hills and hillocks all around in a plum-in-pudding ensemble. Apart from the hilly tracts, swamps, marshes, water bodies, viz. Deepor Beel, Silsakoo Beel, Borsola Beel, Silpukhuri, Dighali Pukhuri, etc. also cover the city.

Many ancient Hindu temples like the Kamakhya Temple, Ugratara Temple, Basistha Temple, Doul Govinda Temple, Umananda Temple, Navagraha Temple, Sukreswar Temple, Rudreswar Temple, Manikarneswar Temple, Aswaklanta Temple, Dirgheshwari Temple, Asvakranta Temple, Lankeshwar Temple, Bhubaneswari Temple, Shree Ganesh Mandir, Shree Panchayatana Temple, Noonmati etc., are situated in the city, giving it the title of "The City of Temples".

Fancy Bazar, Panbazar, Paltanbazar and Uzanbazar are the vintage part of the city forming half radial core pattern around which Guwahati has expanded on the southern bank of river Brahmaputra. Jalukbari to Paltanbazar is the oldest Assam Trunk (AT) road of the city and the most important corridor southward from the city centre is the Guwahati-Shillong (GS) Road stretching 11km to Khanapara. Dispur, the capital complex since 1972, is situated on GS Road stretch, as is Ganeshguri, a major market. The 25km corridor westward of the city centre along Mahatma Gandhi Road takes one to Kamakhya temple, headquarters of Northeast Frontier Railway (Maligaon), Saraighat Bridge linking Guwahati terrestrially to the country beyond, Indian Institute of Technology (North Guwahati), Gauhati University (Jalukbari), Deepor Beel wetland and Lokapriya Gopinath Bordoloi International Airport. The third major corridor Chandmari and an army cantonment at Narangi. The fourth one, RG Baruah Road, is from Chandmari to Ganeshguri and boasts of the Assam State Zoo.

In addition to all this, National Highway 27(old 37) (Asian Highway 1) on the southern part of the city from Khanapara to Jalukbari. The Inter-State Bus Terminus, Maniram Dewan Trade Centre, Balaji Temple and a modern sports complex (Sarusajai) is along this corridor. These corridors fall within the 328 sq km area that the Guwahati Metropolitan Development Authority administers. The older Guwahati Municipal Corporation covers an area of 216 sq km.

The city is also woven around nine reserve forests and two wildlife sanctuaries housing at least 24 species of mammals including elephants, tigers, and leopards and 500 species of birds. Guwahati today is more than just Assam's principal city. It is the access to six sister states in Northeast India and a cultural-commercial bridge to Southeast Asia as envisaged by New Delhi's Look East Policy. To quote Bhupen Hazarika, the city is indeed destined to *jilikabo luitore paar (it will illuminate the banks of river Brahmaputra)*.

1.1.4 Connectivity

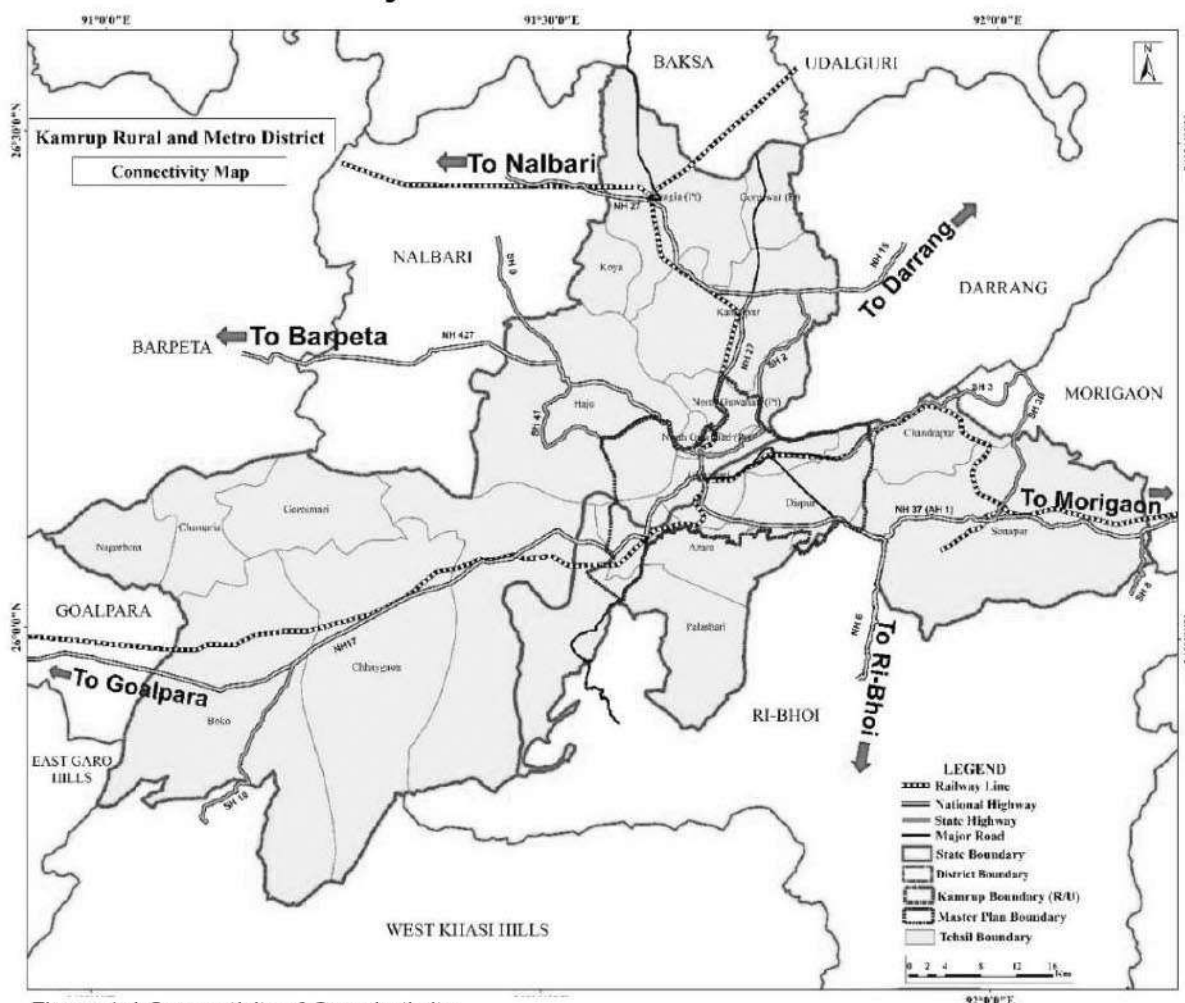


Figure 1-4 Connectivity of Guwahati city

1.1.4.1 By Air

Lokopriya Gopinath Bordoloi International Airport, also known as Guwahati Airport and formerly as 'Borjhar Airport', is the primary airport of the North-Eastern states of India which is located at 25 KM away from the District Head Quarter. Airport is named after Late Gopinath Bordoloi, a freedom fighter and the first Chief Minister of Assam after India's independence. The airport is managed by Airports Authority of India and also serves as an Indian Air Force base. Guwahati airport caters to both private and

national airlines and has been recently converted to an international airport with direct connectivity to South East Asia. Airport serves the upper Assam districts and linked with Agartala, Ahmedabad, Aizawl, Bagdogra, Bangalore, Chandigarh, Chennai, Delhi, Dibrugarh, Hyderabad, Imphal, Jaipur, Jorhat, Kolkata, Lucknow, Mumbai, Silchar, Varanasi, Kolkata, and Delhi

1.1.4.2 By Rail

The Head Quarter of the North East Frontier railway is situated at Maligaon, Guwahati. The nearest railway station from the District Head Quarter Guwahati is within 1 KM. Two broad-gauge railway lines connects Guwahati with rest of India. One via Soraighat Bridge and other via Goalpara, Noranarayan Setu. There are total six railway stations within Guwahati Metropolitan Area. Railway connects Guwahati to nearby major towns like Rangia, Bongaigaon, Khetri etc. and further with the rest of the country. The broad-gauge railway track also connects Guwahati with Dibrugarh-Tinsukia in the east.

1.1.4.3 By Road

Guwahati Metropolitan area has been touched upon by NH31, NH 37 and NH40. NH 31 and it connects GMA with the rest of the country, while NH 40 and State Highways connect the area with other northeastern states of Tripura, Meghalaya, Mizoram, Manipur, Nagaland and Arunachal Pradesh and other cities and towns of Assam. NH 40 is a major link connecting Guwahati city with Shillong, Mizoram and southern parts of Assam. Whereas NH-31 connects the city with Bongaigaon, Dhubri and enters West Bengal in the west. All the census towns and other important areas are located on or along the NH-31 and 37.

1.1.4.4 By Waterway

Guwahati also possesses a developed waterway transportation system along and across the Brahmaputra River, known as the National Waterway 2 which extends from Bangladesh Border to Sadiya. The Inland Water Transport Department is headquartered at Pandu port in Guwahati. The waterways transportation services in Guwahati are used for transporting bulk goods and cargo, and for movement of passenger and tourist vessels. Ferry services are available for transportation of people from different ports along the Brahmaputra to Pandu port. Majuli is also connected through both roadways and waterways.

1.2 History, Evolution & Transformation

During the onset of the colonial age, the name of the city was anglicized to Gawhatty. The spelling was modified to Gauhati in the early part of the twentieth century, and ultimately rectified to conform to the local name [i.e., Guwahati] in the penultimate decade of that century.

1.2.1 Ancient Time

Ancient Guwahati was the flourishing capital of several ancient dynasties during the epic and classical periods. The city that is built by King Narakasur had been the capital of many ruling dynasties. The emergence of modern Guwahati started in 1826. In fact, the post-independence the city had experienced phenomenal growth, in terms of both population and spatial.

The Kalika Purana says Lord Brahma, father of river Brahmaputura, made the area where the city stands today his base to create the stars and planets. The place thus came to be known as Pragjyotishpura, where prag means eastern, jyotish astrology and pura habitation or city. The Navagraha (Nine Planets) temple atop Chitrachal Hills in the heart of the city – one of only two in India – name.

Lord Krishna, reincarnation of Lord Vishnu, made Guwahati his halt too. He passed through thrice, once to marry Rukmini, daughter of king Bhismaka. On another occasion, he came to crush the demon Naraka after Indra, the king of gods, complained that Naraka had stolen his wife Aditi's earrings and had kept 16,000 girls including Apsaras (celestial dancers) captive.

Lord Shiva, the third of the Hindu Holy Trinity along with Brahma and Vishnu, also has a connection with the city. A part of the dismembered body of His wife Parvati, who died at her father Daksha's place, fell on Nilachal Hills. Moreover, Kama, the God of Love, got back his rupa or form near the city after Shiva had reduced him to ashes.



The area where Kama was reborn became Kamarupa and the demon Naraka its king. The Kalika Purana says Pragjyotishapura was the capital city of Naraka's kingdom of

Kamarupa and of Ghataka, the lord of the Kiratas, before him. It further says the city was well protected by a quadrangular giri-durga (mountain-fort). Naraka is said to have placed four great Asura leaders as keepers of four gates of this durga facing the cardinal directions. Pragjyotishpura was also lauded as being on par with Indra's heavenly abode.

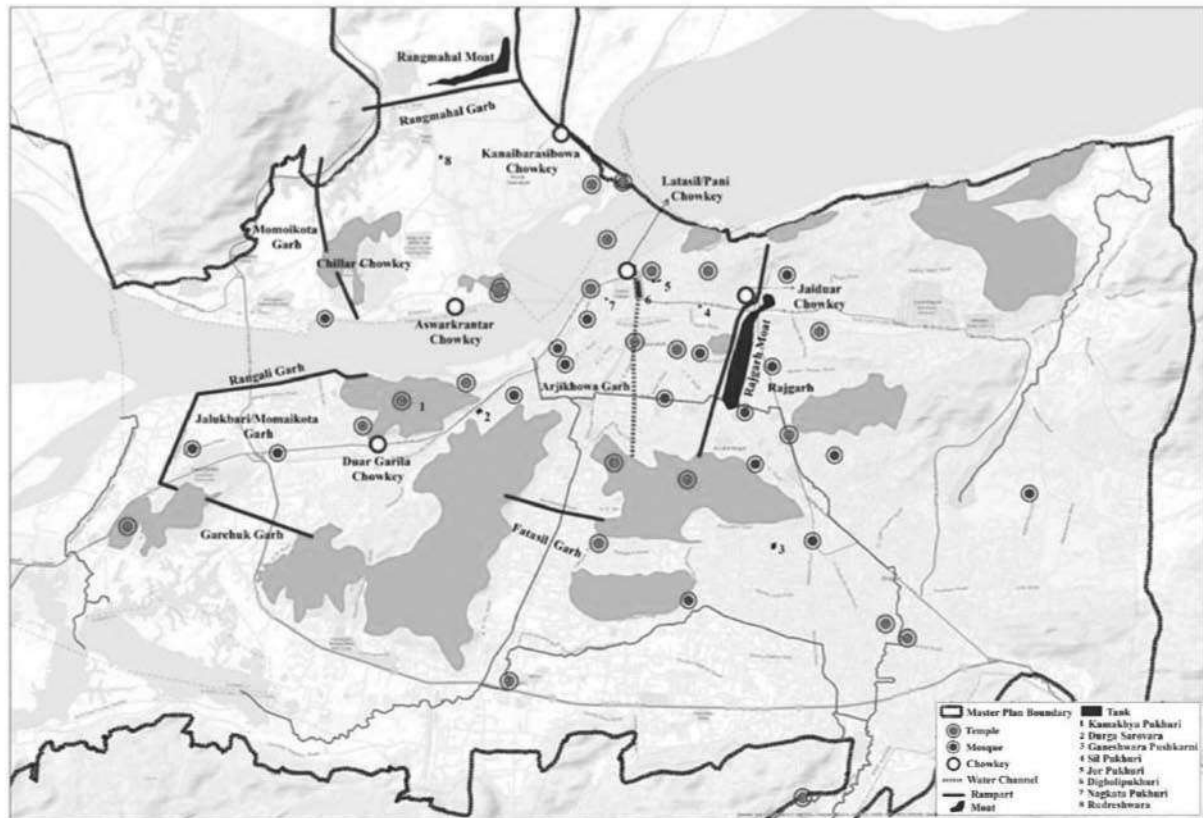


Figure 1-5 Map representing historical settlement of Rampart, Moat, Pukhuries, Temples and Mosque

History took over from mythology with Pusya Varman founding the Varman dynasty in the 4th century. The most illustrious king of this dynasty was Bhaskar Varman (594-640 AD) a.k.a. Kumar Raja for ascending the throne at a very young age and remaining a bachelor. He transformed Kamarupa into a major political power by forging an alliance with northern Indian emperor Harshavardhan.

Bhaskar Varman's reign was marked by the visit of Chinese scholar and pilgrim Hiuen Tsang. Descriptions by the legendary Chinese traveller Hiuen Tsang reveal that during the reign of the Bhaskar Varman (7th century AD), the city stretched to around 15 Km in extent, and was a principal base for a strong riverine naval force. The city remained as the capital of Assam until the 10th – 11th century AD, when it came under the rule of the Pala dynasty. Archaeological evidence by excavations in Ambari, and excavated brick walls and houses discovered during construction of the present Cotton College's

auditorium, suggest the city had economic and strategic importance until the 9th – 11th century AD. He said the kingdom was a centre of learning, and that the local language was similar to Mythili of present-day Bihar.

Between the 12th and 15th centuries AD, after the destruction of the Kamata kingdom, the city became mainly a strategic outpost of the Koch Hajo and Ahom kingdoms. When the western part of the Koch Kingdom (i.e., Cooch Bihar) fell to the Mughals, the eastern half (i.e., Koch Hajo) virtually became a protectorate of the Ahom Kingdom. Although the border between the Ahom and Mughal territories fluctuated between the Kartoya river (now in North Bengal) to the Manas and Barnadi rivers, Guwahati remained an important outpost all throughout the medieval age.

1.2.2 Medieval History

The first Mohmmedan invasion was by Ikhtiyar ud-din Muhammad bin Bakhtiyar Khalji in 1206. A rock inscription at Kanai-barasi-bowa in North Guwahati Mughal attack was similarly thwarted in 1615. But the frontier governor, retook Guwahati in 1659. Three years later, Mughal emperor Aurangzeb sent his general Mir Jumla on a mission to conquer Assam.



Figure 1-6 Statue depicting battle of Saraighat at Brahmaputra South River front of Guwahati

On 5th August 1669, the Mughals killed about 10,000 Assamese soldiers in the Battle of Alaboi, which forced Lachit to take two years to redraw his strategy until the war

resumed in early March 1671. Lachit, camping at Barphukanar Tila (where the old Kamrup DC bungalow is located), was unwell.

Declining to watch the battle from his sickbed, he boarded a boat with six other war vessels and Guwahati was the theatre of arguably the greatest freshwater naval battle in 1671. The city also showed the world, between 1667 and 1671, how the Assamese unleashed commandoes and blended guerrilla warfare with natural elements to defend their territory.

Forces of Muhammad bin Bakhtiyar Khalji suffered a disastrous defeat in the hands of Raja Prithu in Kamrup during Tibetan expedition. The entire army of Bakhtiyar Khalji was defeated by native forces, which forced him to retreat.

The city was the seat of the Borphukan, the civil-military authority of the Lower Assam region appointed by the Ahom kings. The Borphukan's residence was in the present Fancy Bazaar area, and his council-hall, called Dopdar, was about 300 yards (270 m) to the west of the Bharalu stream. The Majindar Baruah, the personal secretary of the Borphukan, had his residence in the present-day deputy commissioner's residence.

The Mughals invaded Assam seventeen times but were defeated by the Ahoms in the Battle of Itakhuli and the Battle of Saraighat in outskirts of Guwahati. There was an ancient boatyard in Dighalipukhuri, probably used by the Ahoms in medieval time. Medieval constructions include temples, ramparts, and other structures in the city.

1.2.3 Modern History

The city experienced a brief period of Burmese rule from 1817 to 1826. After the Treaty of Yandaboo on the 24th of Feb 1826, the city became a part of the British Indian Empire. The present-day city may be regarded as a creation of that age.

Table 1-1 Chronical history of development of town

Year	Event
1826	Modern Guwahati Era began
1836	Town Improvement Committee established
1853	Received Statues of Municipal Board
1876	Guwahati was categorized as Class-I town
1890	Guwahati was connected with the rest of the India by railway line
1961	Guwahati Oil Refinery established
1959	Assam Town and Country Planning Act formulated
1962	Guwahati Development Authority constituted
1969	Guwahati Municipal Corporation Act formulated
1971	Guwahati Municipal Corporation (GMC) was formatted

1974	GMC was duly constituted in the first meeting of the elected councillors as per provision the Act
1985	Development Authority Act formulated (replaced the erstwhile Guwahati Development Authority)

Source: GMC Portal-(<http://www.gmcportal.in:8080/GMCPortal/>); and GMDA-(<http://www.gmda.co.in/glance.php>)

After independence, the city prospered further. when Meghalaya broke away in 1972, the capital of the state of Assam was shifted to Dispur – a then suburb now fully incorporated within the main city. The city has grown by leaps and bounds over the past one and a half decades to establish itself as a full-fledged metropolis.

The establishment of major institutions of higher education like *Guwahati University*, *Engineering College*, and *Medical College* played significant role. After the reorganization of the Assam state in 1972, the capital was shifted from Shillong to Dispur (Guwahati City), whereby the city gained political importance. Since then, the city has been growing enormously in terms of population and development of economic activities.

1.2.4 Demographic Growth in Guwahati

Over the decades, Assam state has been consistently witnessing a balanced growth in population. According to Census 2001, the state comprises around 70% of the population of the northeast. Kamrup district is one of the most densely populated districts of the state and Guwahati city is the fastest growing urban center and the most important city of the Kamrup region.

As per the census 2001, the city's population is 8.9 lakh, which has now crossed the one million mark (Census 2011). The jurisdiction limit of the city during the period of 1971 to 2001 is increased from 43.82 sq.km to 216.79 sq.km, and so the population. The population of the city has grown almost 6.5 times during the same period. Overall, decadal growth of the city is quite balanced. However, with the continuous increase in population over the last few decades and poised to grow further, the city needs a well-planned development plan in terms of its infrastructure to sustain the future growth.

Table 1-2 Demographic growth of Guwahati city

Name	1971	1991	Decadal Growth (%)	2001	Decadal Growth (%)	2011	Decadal Growth (%)
	Population (millions)	Population (millions)		Population (millions)		Population (millions)	
India	548.15	846.3	24.2	1027.01	21.3	1210.19	17.6
Assam	14.63	22.41	23.8	26.64	18.8	31.17	17.0
Kamrup	1.21	2.00	28.7	2.52	25.7	-	-
GMC	0.29	0.65	48.4	0.89	37.8	1.26	40.5
GMDA	0.12	0.58	117.3	0.81	38.6	-	-

Source: Census of India

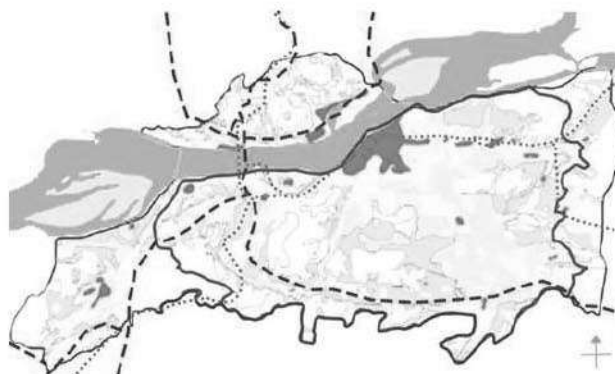
Source: Census of India

1.2.5 Spatial Growth of Guwahati

The evolution process of the city, since its establishment until recent past, can be broadly presented in three stages- 1910s, 1960s, and 1990s. The spatial growth during these three stages is discussed below:

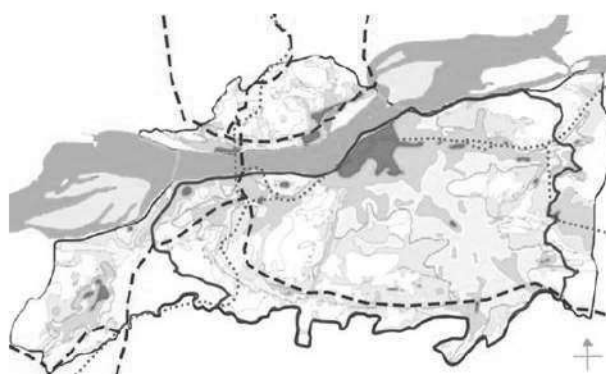
1911-1912 (Area: 7.62 sq.km)

Foundation laid by King Narakasur. Built-up land confined to city core, surrounding the two river ports of Brahmaputra (namely Sukleswar and Kachari Ghat). The areas of Paltan bazaar, Pan bazaar, Fancy bazaar and Uzan bazaar, where emerged out over the time.



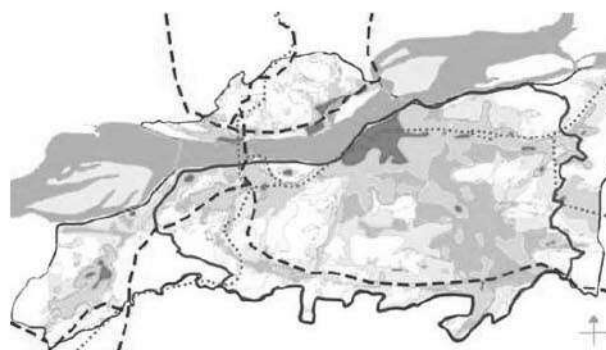
1967-68 (Area: 83.80 sq.km)

The growth mainly remained linear, along the river, and the road network in the periphery. The GMC constituted 34 wards in 1974. Since then, there has been a manifold rise in its population. During the World War II, British government set up the cantonment area near Paltan bazaar and many government institutions were developed. Airport established in 1958



1982 (Area: 132.19 sq.km)

Growth was more pronounced on the southern side to the Dispur- Basistha plain across the narrow corridor between Japorigog and Fatasil hills, and along the NH 37 from Basistha to Tetelia. Many Engineering, Medical colleges were established, and construction of Saraighat bridge got started during this period. Urban area expanded very irregular and discontinuous. (Source: Bhattacharya, 1972; Manpoong, Sujeena; Growth Strategies for Guwahati Metropolitan Area in Context to Environmental Sensitivity, CEPT University)

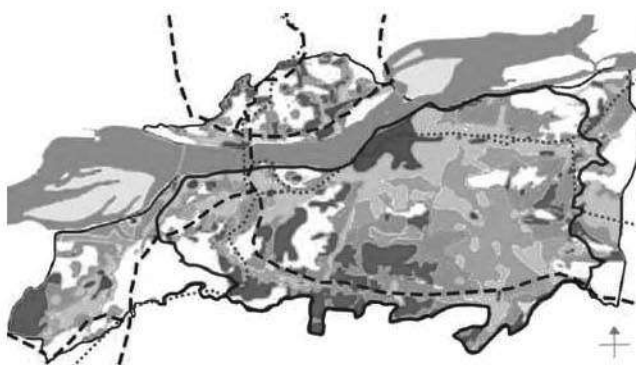
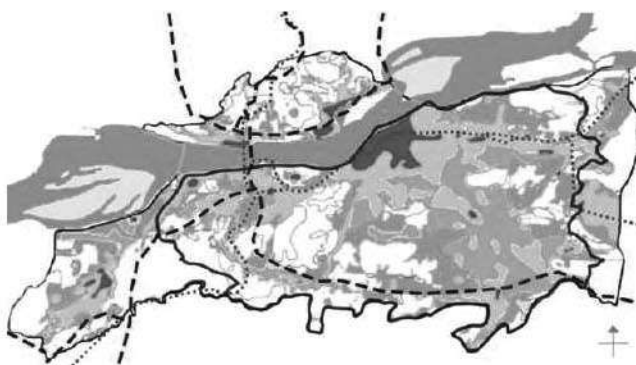


■ **2010** (Area: 225 sq.km)

Being an economic and institutional hub of northeast region, the city expansion was developed. At Amingaon and Jalah observed significant urban growth.

■ **2021** (Area: 328 sq.km)

Northern Bank of Brahmaputra has grown significantly and emerged as North Guwahati Municipal Area consisting of North Guwahati Town Committee. the newly emerged urban Centers. Development along NH-37 observed fast faced specially towards Lokhara, Bartkuchi, Fatasil Gaon and Ahom Gaon region. Growth was more pronounced in Palashbari and Azara.



1.2.6 Review of Existing Institutional Framework

At present in the project area, the Guwahati Municipal Corporation (GMC), and the Guwahati Metropolitan Development Authority (GMDA) are main to authorities that manage the primary development of the city and the GMDA area. Total area covered under GMDA is 328 sq.km, which also includes the GMC area of 216 sq.km, North Guwahati Municipal Board area, 8 Census towns and rural area. GMC covers total 60 municipal wards across the area of 216 sq.km.

At present, multiple agencies are involved with similar responsibilities, which have created problems related to the service delivery. However, though the service delivery area, roles and responsibilities for each agency is clearly demarcated and defined, many times there are duplications of efforts. As a result, consumers must deal with several agencies for redresses and service delivery. The functions and the role of the agencies should be streamlined and entrusted which would help in improving the service delivery and bring in the accountability towards the discharge of civic service.

Table 1-3 Institutional Framework

Public Work	Responsible Department	Designated Specific Area or Jurisdiction (if any)
Water Supply	GMC	Within its jurisdiction
	GMDA	Involved in planning and implementation of South Guwahati West Water Supply project.
	GMDWSB	Mainly through Zoo Road water supply scheme erstwhile AUWSSB transferred to GJB in 2015
	PHED	Primarily Government Buildings and installations
Sewerage	GMC	Currently only involved in cesspool operation. Do not have any treatment facility
	GMDWSB	involved in planning and implementation of sewerage project within Guwahati city
Storm Water Drainage	GMC	Mainly construction and operation Maintenance within its jurisdiction
	GMDA	Mainly construction and operation maintenance within its jurisdiction
	Water Resource Deptt	Planning, design, construction and operation and maintenance of sewerage and drainage,
	PWD	Responsible for roads, drains, guard wall etc.
Solid Waste Disposal	GMC	Planning, design, construction, operation, and maintenance within its jurisdiction
Municipal Roads (Including Flyover)	GMC	Mainly planning, designing, operation and maintenance within its jurisdiction
	GMDA	Mainly planning, designing, operation and maintenance within its jurisdiction
	PWD	Responsible for construction across Guwahati
Street Lighting	GMC	Responsible for planning, designing, construction, operation and maintenance within its jurisdiction
	GMDA	Responsible for planning, designing, construction, operation and maintenance within its jurisdiction
	PWD	Responsible for providing street lighting on All roads owned by PWD across Guwahati
Town Planning	GMDA	Responsible for planning, designing, construction, operation and maintenance within its jurisdiction
	T & CP	Planning and design of areas not covered by GMC and GMDA

**GMC: Guwahati Municipal Corporation, GMDSWB: Guwahati Metropolitan Drinking Water and Sewerage Board, PHED: Public Health Engineering Department, GMDA: Guwahati Metropolitan Development Authority, FCD: Flood Control Department, PWD: Public Work Department and T&CP: Town and Country Planning*

GMC, GMDA and a host of para-statal play a role in infrastructure and services provision in Guwahati. GMC's prime responsibility is to grant building permission and provide and maintain urban infrastructure (road, streetlights, etc) and services (water supply, sewerage, and drainage facilities) in the municipal area through its annual budget. Infrastructure and services like roads and bore-wells are also provided by GMC. GMDA provides infrastructure and services in the GMDA area. Assam Urban Water Supply and Sewerage Board (AUWS&SB), which was formed under The Assam Urban Water Supply and Sewerage Board Act, 1985, and Guwahati Metropolitan Drinking Water and Sewerage Board (GMDWSB), formed in 2011 under The Guwahati Metropolitan Drinking Water and Sewerage Board Act, 2009, are involved in planning and provision of water supply and sanitation facilities in Guwahati. Public Health Engineering Department (PHED) is also involved in water supply provision. Thus, as of now, three agencies, AUWS&SB, GMDWSB and PHED are involved in water supply provision in the city, which covers 30 per cent of the city's residents. The water supply to the rest of the population is through private handpumps or wells and tankers. The Flood Control Department (FCD) and Public Works Department (PWD) also play a role in the planning and design, construction and operation and maintenance of the water, sewerage, drainage, roads, and street lighting.

1.3 Review of Previous Planning Initiatives

In 1974, GMC constituted with 34 wards, with further delineation at present the city comprises total 60 wards. Further, these wards are divided into four revenue zones and twenty-three work zones for administration purposes. Following are few planning initiatives so far have taken to manage the growth of the region.

1.3.1 City Development Plan Guwahati, 2006

City Development Plan (CDP) is planned to create a unique image of Guwahati city, along with promoting sustainable economic and infrastructure growth. The development plan focuses on the Guwahati Metropolitan Area, comprising total 262 sq.km of area. The plan has taken the views of stakeholders, citizens, people's representatives, key members of local industries, academic researchers, and representative of ULBs in consideration while preparing the plan. Based on the study and analysis, the plan identifies the issues in various sectors and proposes the strategies and the schemes for strengthening the each sector. Further, the plan also mentions action plans to implement the strategies. Action plans for following sectors have been proposed in the City Development Plan:

- 1) Action plan for improving the efficiency of infrastructure
 - Water
 - Sanitation and Sewerage
 - Drainage and Storm Water
 - Solid Waste Management
- 2) Tourism
- 3) Improving housing and action towards the slum free city
- 4) Waterfront Development
- 5) Basic service to the urban poor
- 6) Improve intra-inter transport and reduction of congestion
- 7) Environment
 - Action plan for water and air pollution
 - Disaster management
- 8) Reform programs for ULBs
- 9) City investment plan

The CDP is a dynamic document, which has been designed to be responsive to the frequently changing requirement of the citizens and the situation in the city, and therefore the plan should be continuously reviewed and developed to ensure that it is in line with the changing requirements of the people and the situation.

1.3.2 Master Plan for Guwahati Metropolitan Area-2025, 2009

“Guwahati is visualised to be one of the most admired state capitals of India with a unique image.”- Guwahati Master Plan-2025, Vision

Master plan for Guwahati metropolitan area for 2025 was prepared in 2009 for total 328 sq.km of area and for projected population of 21 lakh. The area includes 262 sq.km of existing area and 66 sq.km of additional area. The plan had covered all the villages and mouzas following within the total area. The plan is divided into two parts. The first part explains detailed master plan along with supporting documents while the second part about land use zoning and development control regulations. The plan was prepared to achieve following goals:

- 1) Conserve the city's sensitive natural environment
 - Protect and enhance biodiversity through nature reserves and large open spaces
 - Conserve wetlands and environmentally vulnerable areas
 - Maintain high air and water quality
- 2) To develop an integrated intra-urban transport system
 - Develop modern mass transit system
- 3) To develop well-distributed physical and social infrastructure
 - To have a smooth drainage system free from clogging
 - Municipal water supply and sewerage connection to 100% households
 - A thorough solid waste management system for all type of wastes
- 4) To provide space for functioning of economic activities
 - To provide broad land use pattern considering the potential growth and emerging needs of the area: - to facilitate commercial, industrial, residential, tourism, recreational activities and investments therein
- 5) To create affordable housing for all, and so the city without slums
- 6) To bring in a system in the land development process
 - Development of large areas for integrated urban development
- 7) To evolve an effective implementation strategy

Apart from above mentioned goals, the plan also focuses on creating the city image befitting that of a state capital. The plan has studied the historical data regarding population and economic activities for the perspective year for assessing the various civic needs such as housing, transportation, economic, physical, and social infrastructure. The plan incorporates the urban transportation as an important parameter rather than being a major requirement. Proposed road network in integration with mass transit system were.

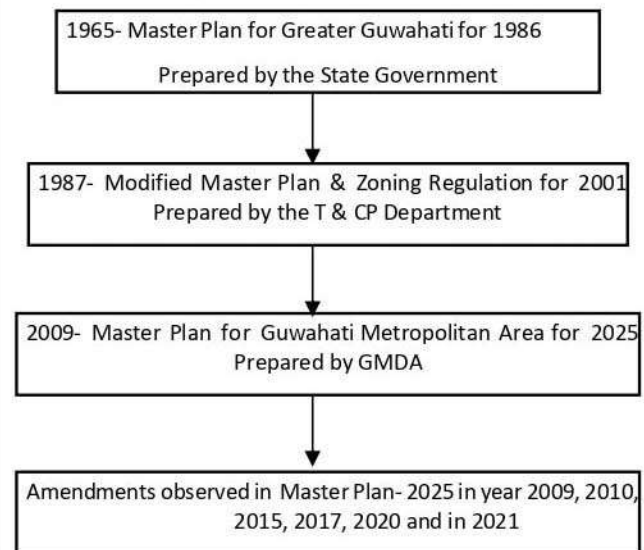
prepared based on the analysis of the traffic survey that was carried out to understand the traffic and travel pattern and for identifying issues, constraints and potentials. The master plan proposes three-tire transport management system for planning, development, operation, and management of the transport development and functions. The plan also has detailed out functions of Guwahati Integrated Transport Board.

Further, the plan has highlighted the issues related to water supply, sewerage system, and solid waste management, and based on the study policies and action plans has proposed for the respective sectors. In addition, the plan has detailed out the situation related to inadequate drainage system in the city and related consequences such as occurrence of flood, and based on the detail study of the situation proposed the possible solution. The plan also proposed three new towns where the additional foreseen population can be accommodated without burdening the existing infrastructure.

The master plan has discussed the various land assembly techniques available for use in the implementation of the plan. Approximately 5.000 hectares of land would be required to achieve the goals of the master plan. With the consideration of developing three new towns, an additional 2.700 hectares land would be required. The master plan proposed to continue with the land use pattern that had envisaged in 2001 plan; nevertheless, to accommodate foreseen population and envisaged important activities the agricultural green belt area envisaged in CMP 2001 has been appropriately used for urban development.

History of Master Plan in Guwahati

To deal with urbanization and related urban issues, the Assam State Government had prepared a first master plan in 1965 with for horizon year 1986.



1.4 Constituents of Planning Area

The delineated New GIS based Guwahati Master Plan Area for year 2045 is a part of Kamrup and Kamrup Metro District.

Table 1-4 Administrative Divisions of Kamrup District (Rural & Metro)

Sl.No	Administrative Division of Kamrup District	Kamrup Rural	Kamrup Metro
1	Sub-Divisions	2	1
2	Revenue Circle	11	5
3	Legislative Assembly Constituencies	6	4
4	Parliament Constituency	1	
5	No. of Development Block	15	3
6	No. of Municipal Boards	2	1
7	No. of Towns	9	7
8	No. of Gram Panchayat	139	-
9	No. of Villages	1024	229
10	No. of Reserved Forest	22	
11	NHs Passing through the district	N.H.- 17,427 and 27	

(*Not in Hierarchy, Source: Govt. District portal Kamrup.nic.in)

1.4.1 Area Inclusion in Guwahati MPA

The GIS Based Master Plan area consist complete units of **7 revenue circles** namely North Guwahati, Hajo, Azara, Palashbari, Chandrapur, Guwahati Circle and Dispur Circle and the parts of Sonapur and Kamalpur revenue circle.

The proposed delineated area for GMPA comprises total 328 sq.km of area (including Brahmaputra River, and reserved forests). The proposed GMPA's boundary extends upto Sonapur revenue circle covering part of Sonapur revenue circle in the east, and till the boundary of Palasbari revenue circles in the west covering part of Azara and Palasbari. In addition to these, small portion of Kamalpur revenue circle in the North covering entire North Guwahati and part of Hajo revenue circle in the Northwest have been included in the extent of the proposed GMPA boundary.

The proposed GMPA comprises total two districts (partly); with total 16 revenue circles (fully and partly) and two reserve forests.

As per, census 2011, total population of the proposed GMPA is 1.1 million, out of which 90% (1.0 million) is urban population and the rest 10% (1 Lakh) is rural.

Hence, the total Master Plan area covers **60 Wards** of GMC, **8 Census Towns**, **1 Outgrowth**, **North Guwahati (4 Wards)** and **79 villages** from rural.

The delineated area has **4 boundaries**,

North– Agyathuri R.F, Natuanacha and Dirgeshwari

South– Rani R.F., Lakhara N.C,

East– Panikhaiti, Amchang WS,

West – Miliya R.F., Sontala

Table 1-5 Municipal Board/ Out-Growth/ Census Town and Revenue Circle

Sl.No	Name of ULB/ Out-Growth/ Census Town	Revenue Circle
1	Guwahati Municipal Corporation (GMC)	Guwahati-Dispur Circle
2	Narengi (OG)	Dispur Circle
3	Jalah (CT)	North Guwahati Circle
4	Amin Gaon (CT)	North Guwahati Circle
5	Bamun Sualkuchi (CT)	Hajo Circle
6	Kahi Kuchi (CT)	Azara Circle
7	Garal (CT)	Azara Circle
8	Azara (CT)	Azara Circle
9	Dharapur (CT)	Azara Circle
10	Changsari (CT)	North Guwahati Circle

1.4.2 Municipal Wards

Table 1-6 Municipal Ward Area Circle wise

Ward No.	Area (Sq.km.)	Circle	Ward No.	Area (Sq.km.)	Circle
1	5.25	Guwahati Circle	31	1.45	Guwahati Circle
2	9.74	Guwahati Circle	32	0.69	Guwahati Circle
3	0.96	Guwahati Circle	33	1.47	Guwahati Circle
4	0.36	Guwahati Circle	34	1.77	Guwahati Circle
5	1.03	Guwahati Circle	35	1.22	Guwahati Circle
6	0.76	Guwahati Circle	36	2.10	Guwahati Circle
7	0.74	Guwahati Circle	37	2.19	Guwahati Circle
8	2.90	Guwahati Circle	38	1.94	Dispur Circle
9	2.00	Guwahati Circle	39	1.60	Dispur Circle
10	13.35	Guwahati Circle	40	2.25	Dispur Circle
11	6.86	Guwahati Circle	41	4.08	Dispur Circle
12	5.23	Guwahati Circle	42	2.19	Dispur Circle
13	1.64	Guwahati Circle	43	5.19	Dispur Circle

14	1.17	Guwahati Circle	44	2.87	Dispur Circle
15	0.68	Guwahati Circle	45	3.00	Dispur Circle
16	0.38	Guwahati Circle	46	2.98	Dispur Circle
17	0.83	Guwahati Circle	47	2.46	Dispur Circle
18	0.88	Guwahati Circle	48	1.69	Dispur Circle
19	0.96	Guwahati Circle	49	2.44	Dispur Circle
20	0.88	Dispur Circle	50	1.09	Dispur Circle
21	1.24	Dispur Circle	51	4.40	Dispur Circle
22	3.17	Dispur Circle	52	4.82	Dispur Circle
23	8.25	Dispur Circle	53	1.21	Guwahati Circle
24	7.59	Dispur Circle	54	0.91	Guwahati Circle
25	2.57	Dispur Circle	55	3.14	Guwahati Circle
26	2.70	Dispur Circle	56	3.06	Guwahati Circle
27	1.80	Dispur Circle	57	8.36	Guwahati Circle
28	1.08	Dispur Circle	58	4.97	Dispur Circle
29	1.82	Guwahati Circle	59	4.85	Dispur Circle
30	0.76	Guwahati Circle	60	8.21	Dispur Circle
TOTAL				176.17	

Presently, Guwahati Municipal Corporation area is of total 216 sq.km consisting of 176 sq.km for 60 Municipal Wards and remaining 40 sq.km. belongs to Brahmaputra riverbed.

1.4.3 Census Towns

Table 1-7 Area of Census Towns

Sr.No.	Description	Area (sq.km)
1	Jalah (CT)	6.70
2	Amin Gaon (CT)	2.17
3	Bamun Sualkuchi (CT)	5.29
4	Kahi Kuchi (CT)	5.15
5	Garal (CT)	4.41
6	Azara (CT)	3.54
7	Dharapur (CT)	5.49
8	Changsari (CT)	0.41
TOTAL AREA		33.16

(Source: Compiled by Consultant)

1.4.4 Villages

Table 1-8 Villages fall under GMP 2045

Sl. No	Village Name	Area (Sq.km)	Sl. No	Village Name	Area (Sq.km)
1	No.2 Kismat Bansar	0.01	41	Mikirpara Chakardoi	10.28
2	Abhoypuri	3.48	42	Mirzapur	1.97
3	Agchia	2.18	43	Modgharia	3.75
5	Ambari	1.77	44	Namalijalah	3.25
6	Andherijuli	0.99	45	Niz Bansar	0.06
7	Bahupara	0.03	46	Niz Gondhmow	0.94
8	Balaibill	0.21	47	Niz Sundari Ghopa	0.19
9	Barjhar	4.40	48	No. 2 Panikhaiti	0.67
10	Bonda	1.49	49	No.1 Gandhmow	2.06
11	Bongara	0.46	50	No.1 Singimari	1.03
12	Char Majir NC	0.72	51	No.2 Birkuchi	1.38
13	Charmoujuli Gaon	1.09	52	No.2 Bonda	1.95
14	Charmoujuli Pam	1.02	53	No.2 Bonda Grant	0.83
15	Charmoujuli Pam NC	0.13	54	No.2 Dalibari	1.20
16	Dakhin Phulung	0.30	55	No.2 Gondhmow	1.81
17	Deorali	1.25	56	No.2 Singimari	1.62
18	Dhobartari	0.11	57	No.3 Singimari	1.12
19	Fulung	0.69	58	Pachim Dadora	0.65
20	Gauripur	1.86	59	Pamahi	1.95
21	Ghorajan	1.02	60	Paseniapara	1.86
22	Jabe	1.63	61	Patgaon	0.67
23	Janasimalu	1.98	62	Rajapanichanda	0.97
24	Jangalipara	0.68	63	Rakshasini Char NC A	1.10
25	Joypur FV	0.31	64	Rakshasini Char NC B	1.08
26	Jugipara	2.59	65	Rangapara	0.64
27	Kachari Allibari	1.11	66	Rangmahal	2.49
28	Kaitasidhi (Poitasidhi)	1.54	67	Roumari	0.27
29	Kalitakuchi NC	0.75	68	Rudreswar	3.41
30	Kamar Gaon	1.34	69	Sajanpara	0.76
31	Kamargaon	0.16	70	Salesala	0.61
32	Kendukuchi	0.84	71	Sanpara Gaon	0.09
33	Kharghuli Gaon	1.96	72	Sathikarpa	0.57
34	Kharghuli NC	1.87	73	Sila	3.97
35	Kharghuli (Part I & II)	1.57	74	Sila Grant	3.41
36	Khena Allibari	3.20	75	Silamahekhaiti	1.23
37	Losana	0.86	76	Silbharal	0.02
38	Majir Gaon	3.07	77	Sualkuchi Part IV	0.45
39	Maliata	1.43	78	Tiling Gaon	1.69
40	Matikutuni	0.78	79	Tintukura NC	1.41
TOTAL				114.26	

1.4.5 Master Plan Area 2045

Table 1-9 New GIS Based Master Plan Area for 2045

Sl. No.	Particulars	Area (sq.km)
1	GMC (60 Wards) + 1 OG	176.17
2	8 CT (Census Towns)	33.16
3	North Guwahati (4 Wards)	3.89
4	79 Rural Villages	114.78
TOTAL Master Plan Area 2045		328.00

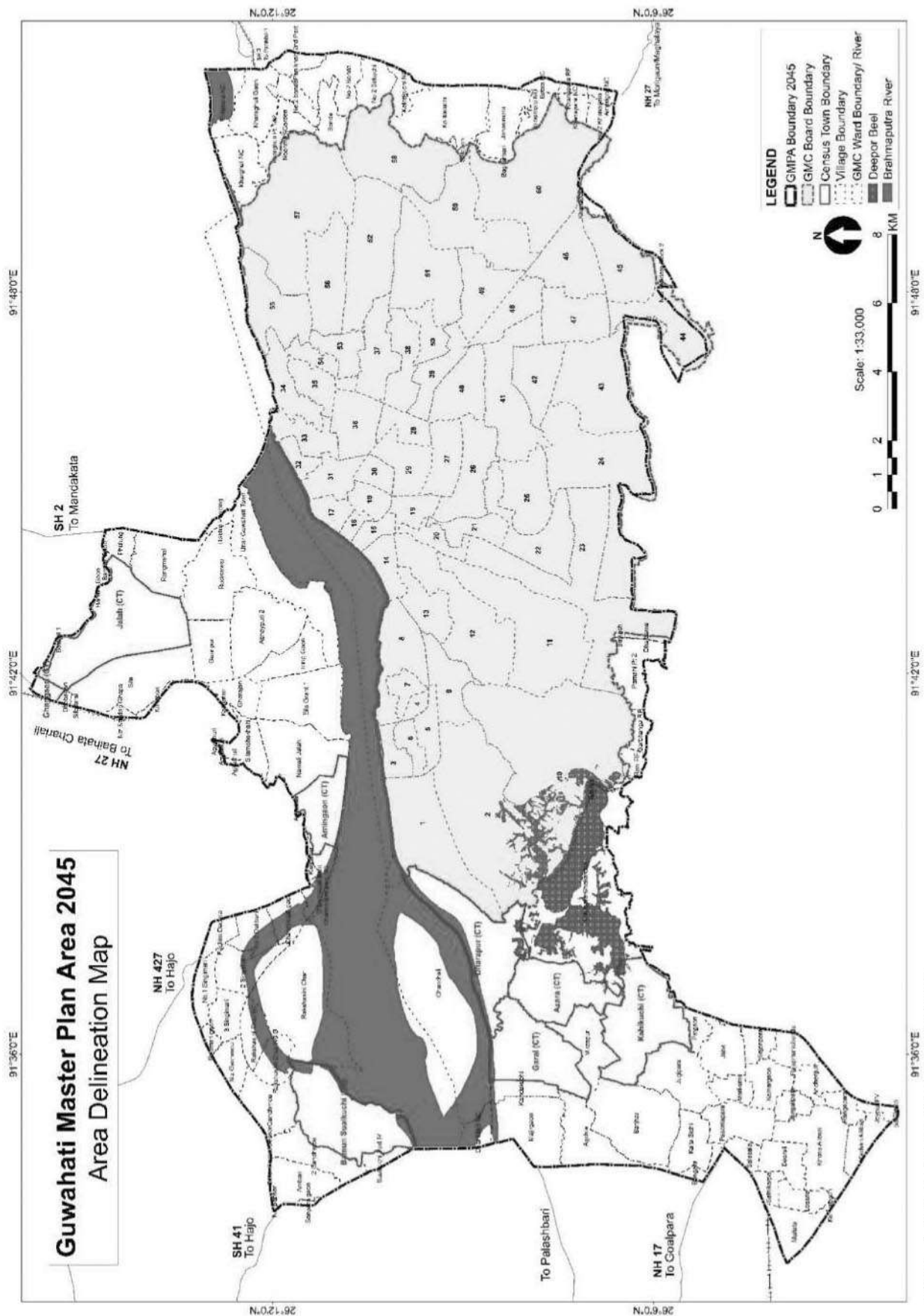


Figure 1-7 Area delineation map for 2045

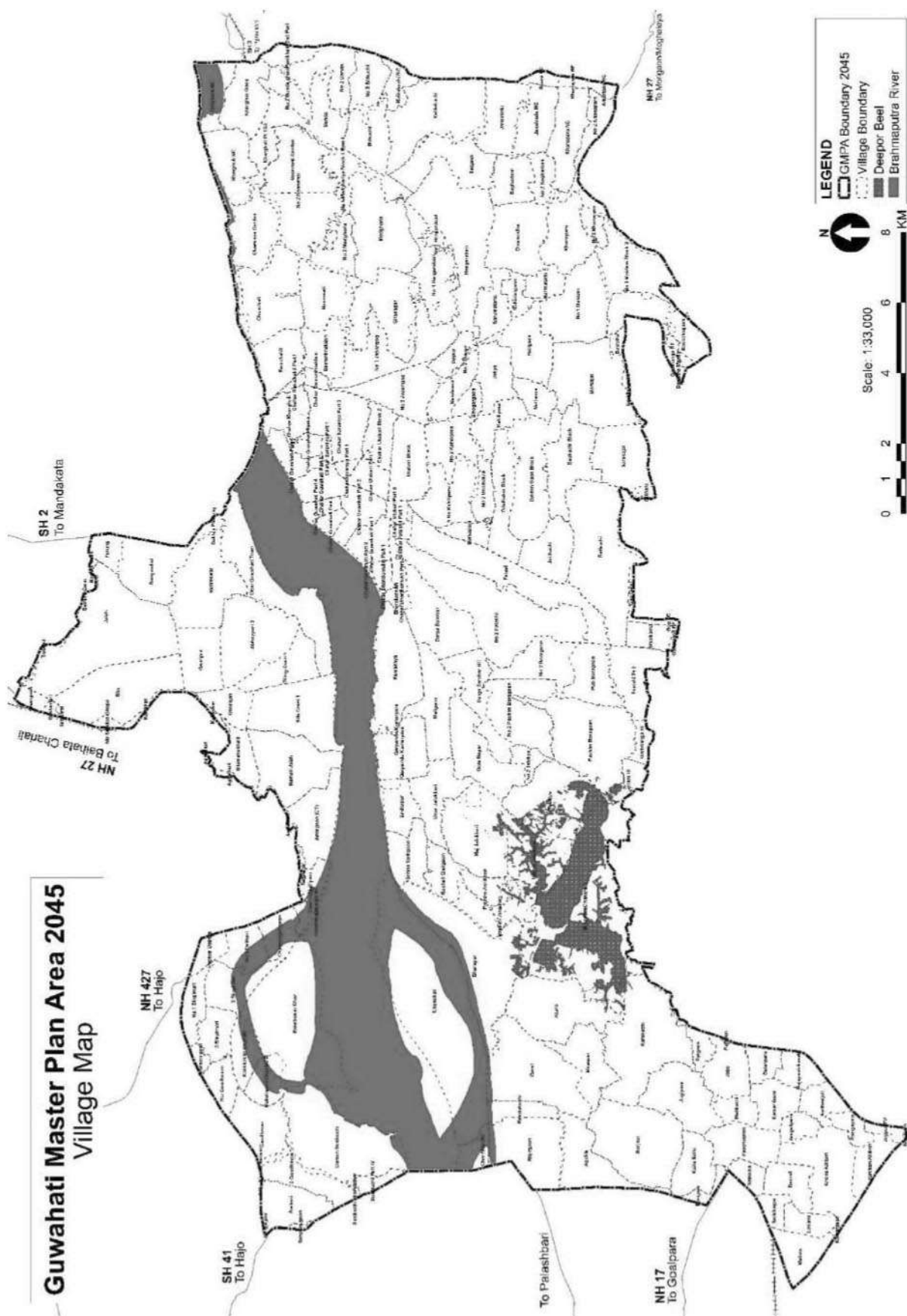


Figure 1-8 Revenue Circles under Guwahati Master Plan Area 2045

1.4.6 Administrative Set-up within the Delineated Area

1.4.6.1 Guwahati Municipal Corporation (GMC)

The Guwahati Municipal Corporation was constituted in 1974 under the provisions of the Guwahati Municipal Corporation Act, 1971. The Corporation covers 216 sq.km of area. The corporation has a council of 60 elected ward councillors. A Mayor heads the council, and the Commissioner is the executive head of the corporation.

The corporation area is falling under both Guwahati and Dispur districts. Total population of GMC area is 0.9 million, out of which 0.5 million population resides in Dispur and the rest are living in the Guwahati district. The corporation is divided into 60 wards for the ease of the governance.

1.4.6.2 Guwahati Metropolitan Development Authority (GMDA)

Under the Guwahati Metropolitan Development Authority Act 1985, the GMDA was established in 1992, which replaced the erstwhile Guwahati Development Authority constituted in 1962 under the Town and Country Planning Act, 1959 (amended).

GMDA's jurisdiction spreads over 328 sq.km of area, comprising the entire GMC and entire North Guwahati Town Committee area, and some revenue villages of Silasundari Ghopa Mouza, Pub Barsar Mouza, Dakhin Rani Mouza, Ramcharani Mouza, and Beltola Mouza. Comprehensive Master Plan-2015, adds an additional area of 66 sq.km by adding three new towns; hence, the total area of the GMDA is 328 sq.km.

The functions of the GMDA include the preparation, enforcement, and implementation of the master plan and the formulation and implementation of schemes for the planned development of the GMR. The functions also include coordination of development activities with other public agencies and regulation and control over the development through statutory plans and other measures.

Apart from GMC and GMDA Corporations, Municipalities and Town Committee manages the implementation of various development at urban level, while Zilla Parishads and Gaon Panchayats manages the development at rural level.

1.4.6.3 Guwahati Smart City Limited (GSCL)

Guwahati has incorporated a special purpose vehicle (SPV) – Guwahati Smart City Limited (GSCL) (the 'Authority') to plan, design, implement, coordinate and monitor the smart city projects in Guwahati. GSCL is a company incorporated under Indian

Companies Act 2013 with equal shareholding from Govt. of Assam. The basic objective of the assignment is to support GSCL to Development of proposed ABD Modules and PAN City proposal. TCE will provide strategic, advisory, liaising, consultancy and project management services to support GSCL in planning, designing, implementing and monitoring Area Based Development Project under the Guwahati smart city proposal.

The strategic components of area-based development in the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city.

The functions of the Guwahati Smart City Limited (GSCL) include the preparation, enforcement, and implementation of city development proposals falls under the purview of Smart City Ltd.

1.4.6.4 Guwahati Public Works Department (PWD)

The Public Works Department (PWD) is one of the oldest and most important Departments of Government of Assam. It was established in the year 1880 under British Rule. At the beginning it had the responsibility for all public infrastructure development involving construction and maintenance works. In 1956 the Embankment and Drainage (E&D) was bifurcated and established as a separate Department.

The PWD has undergone considerable changes since Independence. To enable it to function smoothly and to focus on the priority assigned by the Government on infrastructure development works, the PWD was further bifurcated into two departments, viz. Public Works Roads Department and Public Works Building & NH Department.

The principal function of the Public Works Roads Department (PWRD) is to develop and manage the state road infrastructure for providing connectivity and efficient transportation. It undertakes construction and maintenance of roads, bridges, culverts in the state.

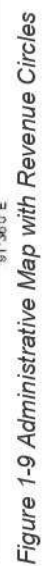
1.4.6.5 Guwahati Metropolitan Drinking Water and Sewerage Board (GMDWSB)

Guwahati Metropolitan Drinking Water & Sewerage Board was established on 21st December 2011 with a view to promote uninterrupted, hygienic, piped drinking water and encourage a hygienic environment in the Guwahati Metropolitan Area (GMA) in accordance with the Guwahati Metropolitan Drinking Water and Sewerage Board Act, 2009, published on 28th February 2009.

Guwahati Metropolitan Drinking Water & Sewerage Board (GMDWSB) was established as a single organization responsible for Water Supply & Sewerage services to the residents of the Guwahati Metropolitan Area (GMA). Upon completion, the water supply facilities now under implementation will be taken over by the Guwahati Metropolitan Drinking Water & Sewerage Board, which will also be responsible for operating and maintaining them on a sustainable basis.

- The Board will plan, design, construct, maintain, operate & manage the Water Supply system and the sewerage and sewage treatment works in GMA
- The Board will plan, regulate, and manage the exploitation of ground water
- The Board will promote measures for conservation, recycling, and reuse of water
- Provide hygienic and safe drinking water for the residents of Guwahati Metropolitan Area
- Proper Treatment of wastewater and sewage to promote a hygienic environment for the public
- Promotion of water supply and sewerage connections
- Promotion of meter-based payment compliance
- Improvement of customer relationship

Parallely, all other city stake holding Government bodies are also involved in implementation of proposals under their own departments.



1.4.7 Change in Administrative Boundaries *(at Revenue Circle Level)*

As per Census 1991 and 2001, the region broadly falls under four districts (namely Kamrup, Darrang, Nalbari, and Morigaon) comprising 12 revenue circles, 10 urban centres, and 1,072 villages. However, in Census 2011 districts' boundaries are changed. Kamrup district is divided into two parts: Kamrup District and Kamrup Metropolitan District. In addition, Guwahati, Sonapur, and Chandrapur RCs are also form a part of the newly formed district. Further, a new revenue circle has formed by dividing N. Guwahati revenue circle into two parts, where the northern part of the N. Guwahati RC falls under the Kamrup district and the southern portion is part of the Kamrup Metropolitan district. In addition, new revenue circle called Azara is created by splitting Palasbari RC, which is falling under the Kamrup Metropolitan district, while the rest of Palasbari circle is still part of the Kamrup district. Apart from Azara and North Guwahati part, one more new RC named Goroimari is formed, which is also the part of Kamrup district. As a result, in Census 2011 the project area falls under 5 districts (namely Kamrup, Darrang, Nalbari, Morigaon, and Kamrup Metropolitan) comprising of total 15 RCs.

Table 1-10: Change in District and Revenue Circles Jurisdiction over the Decades

---	1991	2001	2011
No. District	4	4	5
District Name	Kamrup, Nalbari, Darrang, Morigaon	Kamrup, Nalbari, Darrang, Morigaon	Kamrup, Kamrup Metropolitan, Nalbari, Darrang, Morigaon
No. RCs	12	12	15
RC Name	Kamrup- Kamalpur, Hajo, Chhaygaon, Palasbari, North Guwahati, Dispur, Sonapur, Chandrapur, Guwahati	Kamrup- Kamalpur, Hajo, Chhaygaon, Palasbari, North Guwahati, Dispur, Sonapur, Chandrapur, Guwahati	Kamrup- Kamalpur, Hajo, Chhaygaon, Palasbari, North Guwahati (Part), Goraimari
	Nalbari- Barkhetri	Nalbari- Barkhetri	Nalbari- Barkhetri
	Darrang- Sipajhar	Darrang- Sipajhar	Darrang- Sipajhar
	Morigaon- Mayong	Morigaon- Mayong	Morigaon- Mayong
	---	---	Kamrup Metropolitan- Dispur, Sonapur, Chandrapur, Guwahati, N.Guwahati (Part), Azara

Source: Census 1991, 2001, and 2011 Data

1.4.8 Evolution of Urban Areas over the Decades (1991-2001 & 2001-2011)

Over the past two decades, many new urban areas have emerged in the region. As compared to 1991- 2001 decade, the region has experienced much faster growth in urban areas during the 2001-2011 decade. Number of urban areas has increased from seven in 1991 to 30 (including Narengi outgrowth) in 2011. Refer annexure-2 for the list of the evolution in urban areas over the decades.

Since over the past two decades, the GMC is experiencing rapid growth as compared to rest of the region, due to which the growth rate in Kamrup Metropolitan and Kamrup districts are high. These districts are growing at a very fast pace as compared to other districts in the project area. In fact, the maximum growth has been observed in the areas situated on the west of the existing boundary of GMDA area, especially in Palasbari RC, along the NH 37 corridor. Ten villages have been identified as census towns in this area between Census years 2001 to 2011; while three newly emerged urban areas have been classified on the east of the city along the NH 37 corridor.

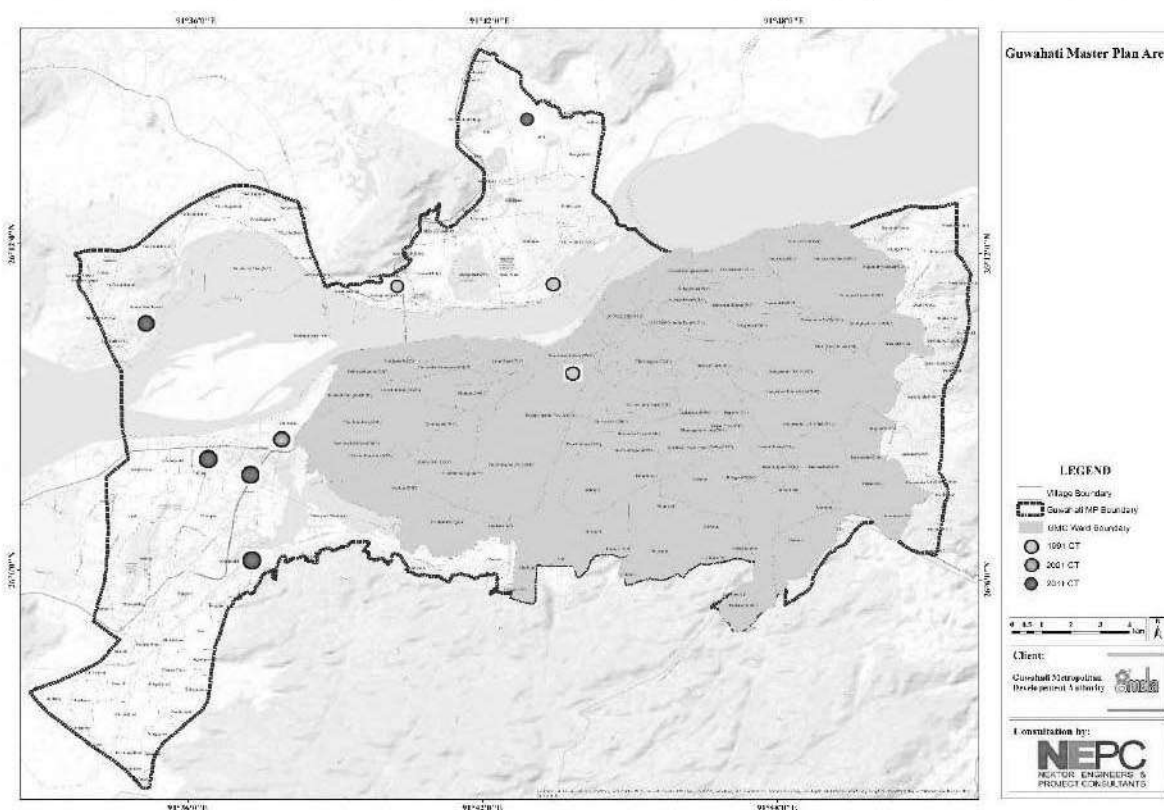


Figure 1-10 Evolution of Urban Areas over the Three Decades

In addition, in North Guwahati RC, two new urban areas have been mapped along the transportation corridors. Noticeably, majority of new urban areas have emerged around the Guwahati city area; nevertheless, the city is always named as the main

development centre in the region. The city is growing at much faster rate as compared to any other urban areas in the region. The population in GMC has crossed nine lakhs, while the population in rest of the urban areas is below thirty thousand.

The urban towns that surround GMC contribute and complement to its functional performance. These towns are fourth, fifth, and sixth order urban settlements whereas Guwahati city is a first order urban settlement with a population of around nine lakhs. Therefore, the surrounding towns depend on the city for the higher end services. The existing infrastructure in the city is inadequate for its own population, and in addition, the growing urban population in the agglomerated area is adding pressure to the infrastructure. As a result, many floating populations is observed in the Guwahati urban area for various services.

Table 1-11: Census town in 1991, 2001 & 2011

CTs Classes	Class Range	No. of census towns in 1991	No. of census towns in 2001	No. of CTs in 2011
Class I	1,00,000 & above	1	0	0
Class II	50,000 - 99,999	0	0	0
Class III	20,000 - 49,999	0	0	0
Class IV	10,000 - 19,000	1	0	0
Class V	5,000 - 9,999	1	1	4
Class VI	<5,000	0	0	1

(Source: Census 1991, 2001, and 2011)

1.5 Climate

1.5.1 Temperature

The climate of Guwahati does not differ from that of the other districts of Assam. Guwahati has a humid subtropical climate. The average annual temperature is 22.2°C, with extremes ranging from 39.5 C recorded on 24 April 2014 to 2.0 C recorded in January 1964. In March and April, the weather begins to grow a little warmer. During the height of the rains, the climate is decidedly oppressive.

Climatically from February to May, the weather is dry and moisture less and the heat is gentle; from June to October, there is enough rain and moisture, and the heat is very unbearable and from November to January, the climate is cold and foggy. During the latter part of December and early part of January, the Brahmaputra fog can be very cold while in March, the wild wind carrying the Brahmaputra sand can be seen everywhere.

From the end of February, the mercury level gradually goes up and in July, August and September the temperature reaches the maximum point. During these months,

the mean maximum temperature does not generally come down below 31°C and even sometimes it goes to above 40°C. These months are treated as hottest months for the district in each year.

Table 1-12 Month wise Min and Max Temperature

Month	Min	Max.	Month	Min.	Max.
January	8.5	21.6	July	25.3	31.7
February	10.9	25.1	August	25.4	28.8
March	15.5	38.1	September	24.4	31.4
April	19.9	25.3	October	19.9	30.2
May	22.4	26.7	November	14.8	36.5
June	24.8	28.4	December	9.8	23.4

(Source: India Meteorological Department)

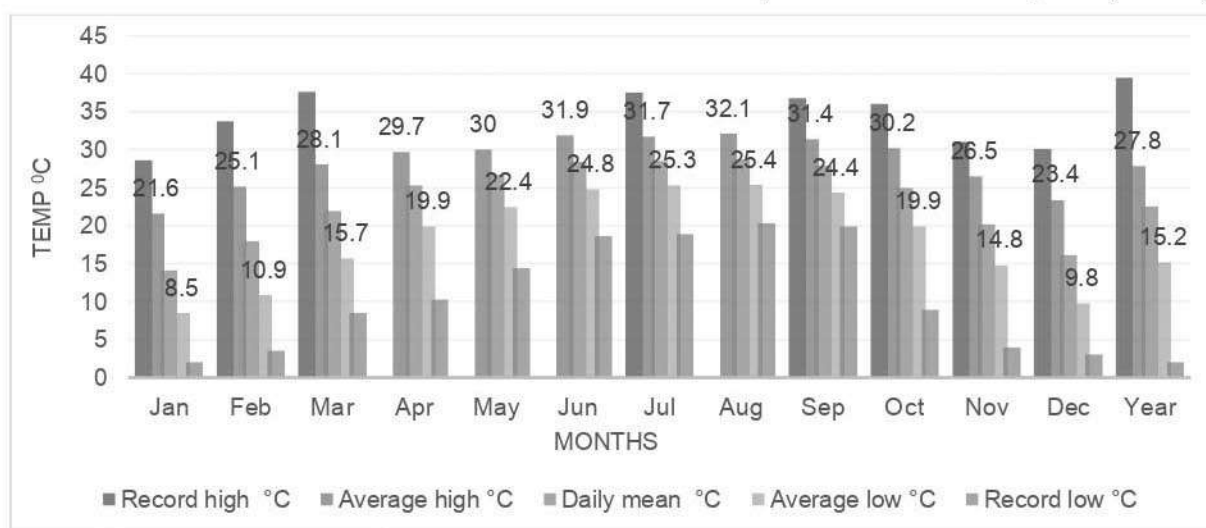


Figure 1-11 Monthly min and max temperature

1.5.2 Rain Fall

The average rainfall in the Guwahati is 1751.8 mm with average relative humidity of 72%. Rainfall records shows a decreasing trend towards east and west of Guwahati city. The average rainfall is 146 mm. The months of March, April and May constitute the pre-monsoon season. The norwesters locally called Bordoichilla appears during that period. Rainfall ranges between 58 mm and 243 mm. With the onset of monsoon in early June, heavy rainfall occurs. Widespread low clouds and high humidity together maintain almost uniform temperature over the area. The average annual rainfall during the period is 326 mm. The occurrence of thunderstorms is the most conspicuous characteristics of the monsoon weather. This is the season of dominant agricultural operation. The monsoon withdraws from the area in the last week of September or first week of October. The cool north-easterly winds originating over the lofty

mountains of the Meghalaya brings the temperature down. The orographic low is replaced by high pressure and a flat pressure gradient occurs. Rainfall decreases abruptly and the sky becomes progressively clear. Sunny days prevail till the end of November. Month wise normal maximum and minimum temperature is given in Table 1-12

Table 1-13 Monthly and Annually Rainfall data

Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
Rain Fall mm (inches)	12.0 (0.47)	22.3 (0.88)	58.4 (2.30)	187.8 (7.39)	243.1 (9.57)	295.0 (11.61)	326.2 (12.84)	265.7 (10.46)	197.8 (7.79)	121.3 (4.78)	16.0 (0.63)	6.2 (0.24)	1,751.8 (68.97)
Avg. rainy days	1.2	2.3	4.7	10.3	13.3	14.7	16.1	12.9	9.7	5.0	1.0	0.6	91.9
Avg. relative humidity(%)	70	56	50	62	70	77	80	80	81	79	77	76	72

(Source: India Meteorological Department)

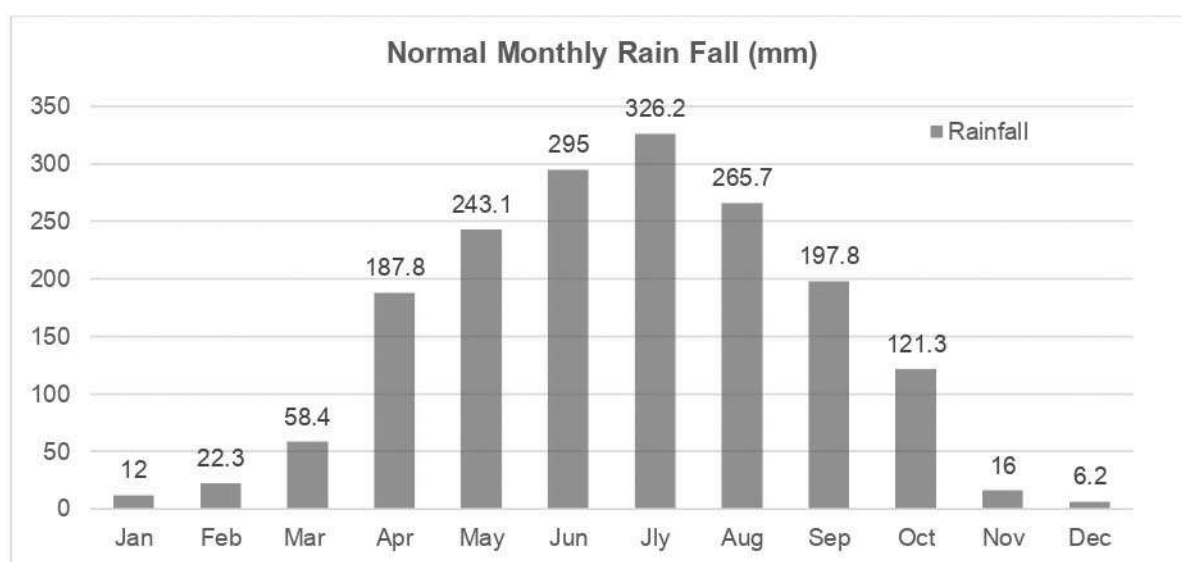


Figure 1-12 Monthly normal rainfall

1.6 Topography

The proposed GMPA is a part of the Brahmaputra basin. The Brahmaputra bank is in a linear shape with a series of hills along the periphery, except for a portion in the west where the Dipor Beel is situated. Guwahati's natural terrain consists of a bowl-shaped valley that consists of number of hills and beels (natural wetlands) interspersed along its landscape, especially on the southern and eastern sides. The river passes through the region dividing it into two parts- north and south. Geologically, the city is

characterized by Pre-Cambrian granite forming the hills and hillocks, presence of alluvium and quaternary deposits dominate the city's physiography.

Depth of the river in Guwahati is about 47m, and width of the basin, within Assam, is 70-80 km. The Guwahati City is situated on an undulating plain with varying altitudes of 49.5 mt to 55.5 mt above mean sea level. However, the riverbank is higher than most of the city areas; due to which many areas in the city gets waterlogged during monsoons. In addition, the region has the antecedent type of drainage pattern. Lateral erosion as well as changes in the faults due to earthquake causes the river to change its course often.

Guwahati Metropolitan Area has on the south a hill range known as K&J Hills, on the east isolated hilly areas, on the north river Brahmaputra and on the west low laying areas of Deepor Beel. Any rain on these hill slopes towards the Metropolitan area will create run off considerable volume entering GMA.

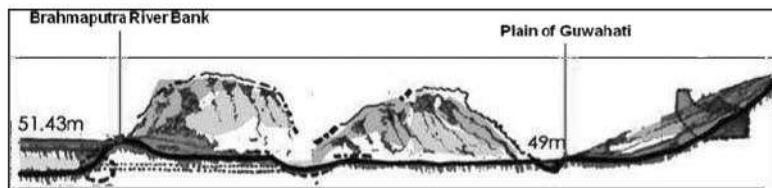


Figure 1-13 Schematic Section of the Guwahati City (Source: Lopamudra Neog; *Urban Landscape as Infrastructure and Economic Resources, Revitalization of Sola Precinct, Guwahati*, 2010; CEPT University)

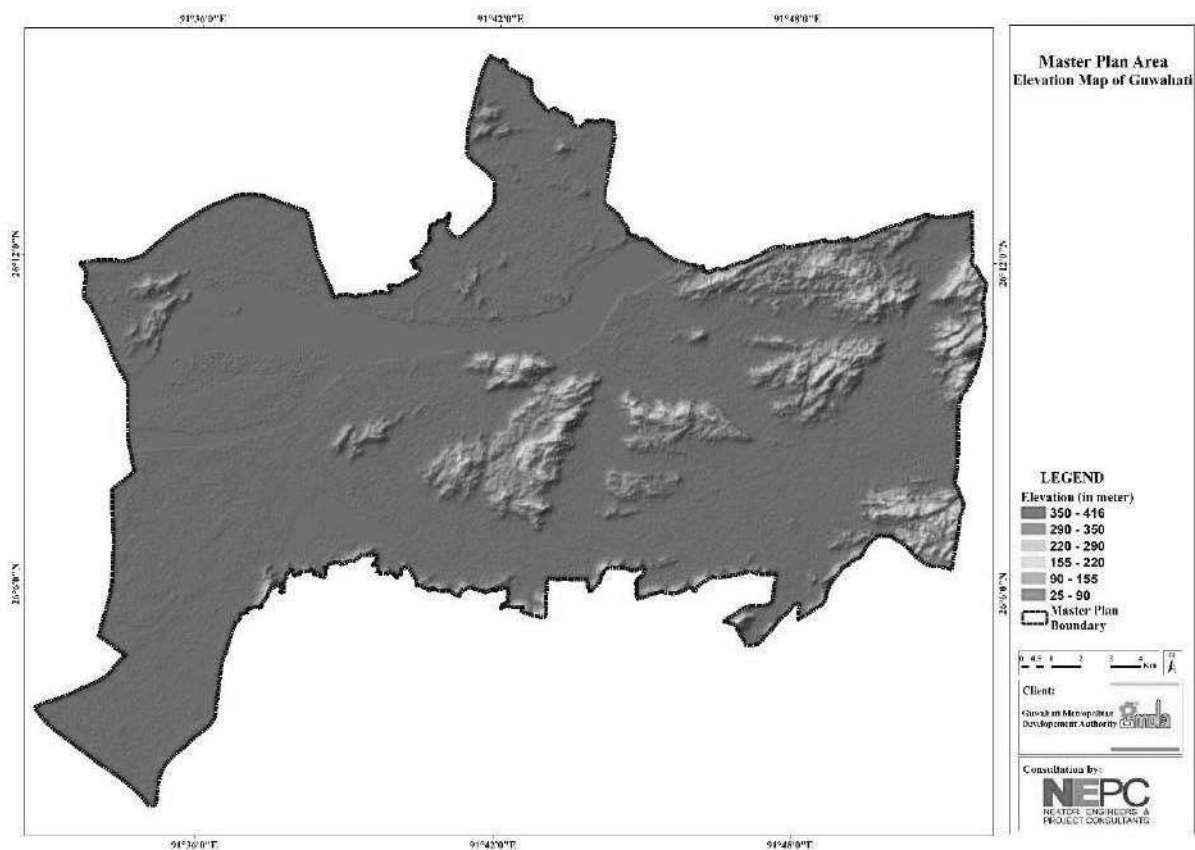


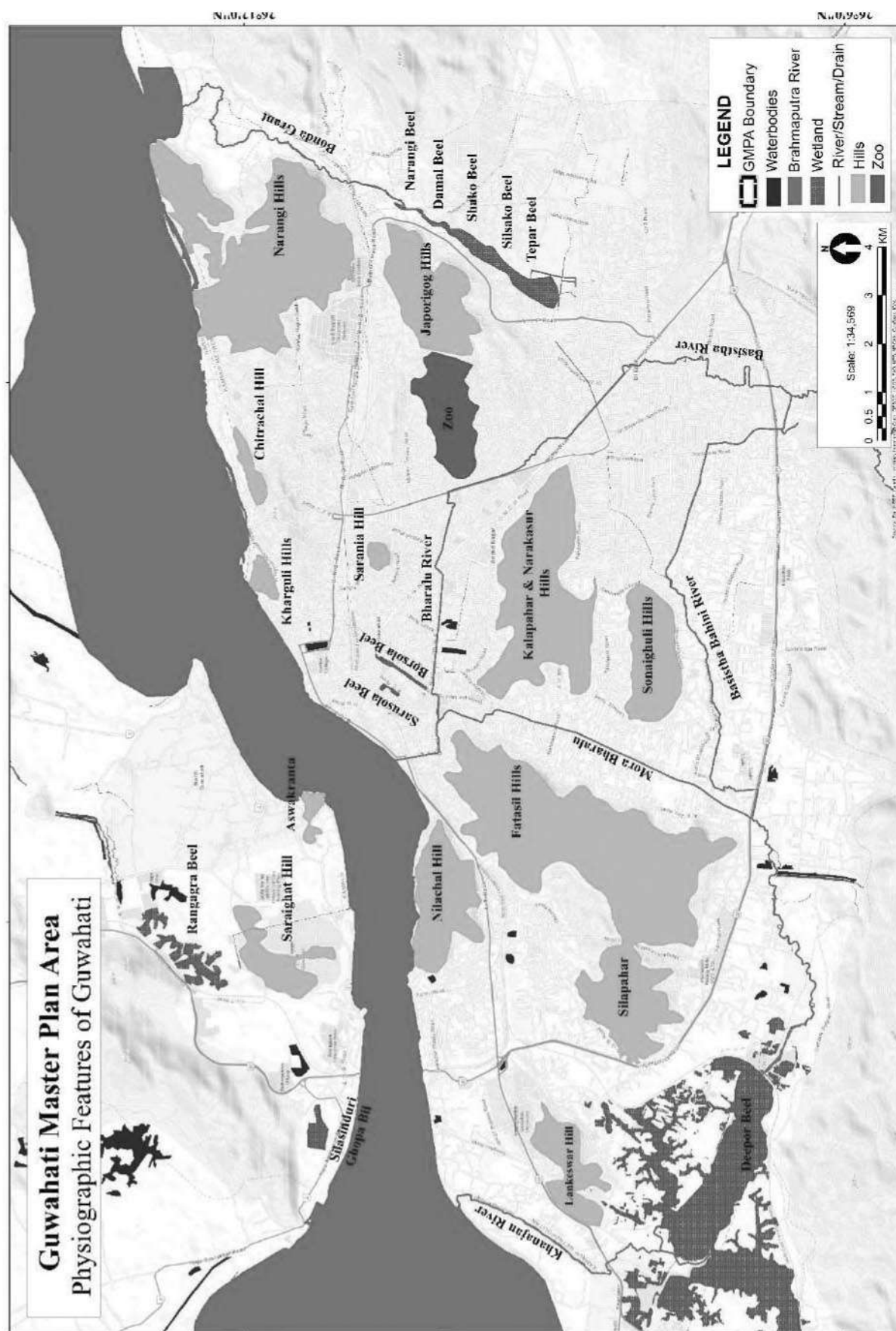
Figure 1-14 Guwahati MPA Digital Elevation Map

Physiographically, the master plan area is an area with highlands, flood plain, beels, swamps and foothills. The northern boundary of the MPA is bounded by river Brahmaputra which is wide with average width of 10 km.

Hills: The southern and eastern sides of the city are surrounded by hills. The central part of the city also has small hillocks namely Sarania hill (193 m), Nabagraha hill (217 m), Nilachal hill (193 m) and Chunsali Hill (293 m).

1.6.1 Natural Resources

Guwahati is rich in natural resources comprising of various hills, forest, and water bodies, covering its landscape. In fact, water bodies cover around 6.8% of land the Guwahati city land. The major geographic feature is the Brahmaputra River, which divides the region into north and south.



1.6.2 Rivers

1.6.2.1 *Brahmaputra River*

Brahmaputra River in Assam is almost 700 km long with more than 100 tributaries. It is the major natural feature in the region. The length of the river in the city is around 29 km with 49 sq.km of total area. It is one single surface water source for the region.

1.6.2.2 *Bharalu River*

Bharalu River rises as a small stream from the southern range of Khasi Hills and flows through the city gaining momentum in width and depth; and ultimately joining the Brahmaputra. The natural topography of the city guides flow of the rainwater towards river Bharalu and Basistha. The bed level of this river has considerably risen due to siltation. The shores often create temporary wetlands in winter. This is an important drainage channel for the city and most of the drains, directly or indirectly fall into the river Bharalu. Today, Bharula is the most polluted and contaminated of all tributaries of Brahmaputra.

1.6.3 Wetlands

Wetlands in the city are in the form of lakes, ponds, and low-lying marshes. There are four major wetlands (called "beel" in Assamese) in the city namely: Dipor Beel, Sarusola and Borsola Beel, Hansora Beel, Narengi and Silsako Beel.

This led to the Guwahati Water Bodies (Preservation and Conservation) Act, 2008, which notified the Sorusola, Borsola, Silsako, Deepor and Bondajan waterbodies for protection and conservation. However, it has failed to bring any positive changes. The Kamrup Metro district administration constituted four task forces in January 2013 for the preservation, protection, regulation, and maintenance

1.6.3.1 *Deepor Beel*

Dipor Bil, also spelt Deepor Beel (bil or beel means "lake" in the local Assamese language), is a significant waterbody in the area located to the south-west of Guwahati city, in Kamrup Metropolitan district of Assam, India. It is a permanent freshwater lake, in a former channel of the Brahmaputra River, to the south of the main river. It is also called a wetland under the Ramsar Convention which has listed the lake in November 2002, as a Ramsar Site for undertaking conservation measures on the basis of its biological and environmental importance. Many bird species, water life, and plants thrive in the beel's native habitat.

Earlier the wetland was spread over 4000 ha, which is now has shrunk to 500 ha. Illegal Constructions on the periphery, dumping of garbage, encroachment, brick kiln, and soil quarrying in the lakebed are the direct threats on the wetlands of Guwahati. Potential threats include poach, encroachment, and human pressure upon water birds, pollution from sewage of part of the Guwahati city and infestation by water hyacinth. Since a major part of the catchment area of the beel is the reserve forest of Rani – Garbhanga hills, the runoff water from the area flows into the lake mainly through Basistha – Bahini and Bhalarulu rivers. The major outlets are the Khandajan and Kalmoni which link the wetland with the Brahmaputra. Agriculture particularly Bodo paddy cultivation is the most dominant activities in the surroundings.

The Kalmoni river after emerging from Khasi and Jaintia hills finds its way into the river Brahmaputra partly through Deepor Beel. The hill ranges of the city have considerable effect on the drainage of the beel. Due to the topography of Guwahati, the storm water as well as large portion of the wastewater of the city finds its way to the beel through different channels and rivulets of Greater Guwahati.

The river Khandajan acts as an outlet of Deepar Beel and it ultimately discharges into the river Brahmaputra through a sluice gate.

Comprehensive Plan 2025 for Guwahati city proposed to develop the beel area as a natural reserve as an extension of the capital complex.

1.6.3.2 *Borsola and Sarusola Beels*

Sola Beel, which consists of the Borsola Beel and Sorusola Beel, is situated near Paltan Bazar. Sorusola Beel serves the Chandmari, Gandhibasti, Solapur, Ulubari, Manipuribasti, Fancy Bazar, Panbazar, Lakhtokia, Tokobari, and AT Road areas as a stormwater reservoir. Borsola and Sarusola Beels are two linear wetlands that are located in the heart of the Guwahati city. Both the beels separately connect to Bharalu River in Sabipool area. Total area of the beels is approximately 12 ha. Two major municipal drains carry municipal wastes to the wetland.

Borsola beel was once a beautiful natural lake and home to many local migratory birds. But in course of time, it has become a dead pool of water. Among the major vegetation water hyacinth is common which gets dried in the winter season.

1.6.3.3 Silsako Beels

Silsako Beel is in the South-eastern part of the city. Earlier it was spread over 120 hectares, but the construction of a multiplex, tennis court, a hotel owned by the Tata Group, a hotel management institute, and a research institute has shrunk the wetland. On the other side of this wetland there are over 1,000 huts where families have been residing since about 15 years. Most of them are migrants driven to the city due to the collapse of the rural and agricultural economy in the post-1990s period. Silsako Beels are in the Bondajan Basin. Silsako Beel relates to two small rivulets, while Bondajan basin relates to Brahmaputra. It has been observed that the beds of both the wetlands is flat and shallow and is becoming shallower because of increasing siltation.

1.6.3.5 Bondajan Wetland

Bondajan Beel is in the South-Eastern part of the city. On 10th May 2010 Assam Govt. has notified Bondajan wetland in Guwahati Waterbodies (Preservation and Conservation) Act, 2008 to provide for preservation, protection, conservation, regulation, and maintenance of more water bodies within the jurisdiction of Guwahati Metropolitan Development Authority. Bondajan waterbody has four lane PWD road on North, Birkuchi village and Oil India in South, Maria Public School and Matghariya village on West.

Guwahati's wetlands have been degrading. Reasons are natural siltation, earth filling, encroachment, and garbage dumping. In fact, a large part of Guwahati has developed on wetlands leading to their destruction. After the economic boom in the 1990s, wetlands were sold dirt-cheap. Along the Guwahati to Dispur National Highway, the wetlands have been developed with commercial complexes and apartments. Residential areas like Tarunnagar and Lachitnagar (Bera 2011b)². Areas like Six Mile and Jalukbari had wetlands. Marshy areas have also been settled by the urban poor and gradually filled up as the value of the land has increases, they get transferred to economically well-off people. Large settlements of the poor have emerged by filling up low-lying areas at Bhaskarnagar near R.G. Baruah Road, and on marshy land near Pandu area (Borah & Gogoi 2012)³. In recent years, the government has also allotted

² Bera, S. (2011b) "Who messed it up?" Down to Earth, September 15, 2011. <http://www.downtoearth.org.in/content/who-messed-it> (accessed on 16.12.2013)

³ Borah, J. and B. Gogoi (2012) "Growth of Slum Areas and Changing Land Use Pattern in Guwahati City, India," The Clarion 1:2, pp. 189-195.

large parcels of land in the wetlands of North Guwahati to public and private institutions. The degrading condition of some of the wetlands is discussed below.

All around the city, in the rural settlements as well, which may integrate with GMC area in the future, beels are being encroached upon, with houses on stilts to begin with. In Guwahati, the Hansora and Damol wetlands already have disappeared completely. With the disappearance or eutrophication of the wetlands, which serve as storm water basins, the incidence of flash floods has increased in Guwahati. This led to the Guwahati Water Bodies (Preservation and Conservation) Act, 2008, which notified the Sorusola, Borsola, Silsako, Deepor and Bondajan waterbodies for protection and conservation. However, it has failed to bring any positive changes. The Kamrup Metro district administration constituted four task forces in January 2013 for the preservation, protection, regulation and maintenance of the two important natural waterbodies of the city, Silsako Beel and Bondajan (Kalita 2013)⁴. Prior to this The Assam Hill Land and Ecological Sites (Prevention and Management) Act, 2006, had been enacted to provide for preservation, protection, regulation, acquisition, and maintenance of hill land and other ecological sites of the State and more specifically within the jurisdiction of the GMC. The implementing authority is the State Government through formation of Advisory Committees, chaired by the Commissioner of Lower Assam Division for Guwahati and the respective commissioner of the other divisions in the rest of the State. This legislation is to prohibit anyone indulging in (i) any earth cutting activities or carrying any portion of a hill land causing damage or destruction of such hill, (ii) removal or filling up or dredging or any way altering any of the ecological sites, and (iii) undertaking any such activity which may cause damage or destruction to the vegetative cover and wildlife resources of any designated area (Das 2012)⁵.

1.6.4 Hills

The southern and eastern sides of the city are surrounded by hills. The central part of the city also has small hillocks namely Sarania Hill (193 mt), Nabagraha Hill (217 mt), Nilachal Hill (193 mt) and Chunsali Hill (293 mt).

⁴ Kalita, K (2013). "Task Force Constituted to Preserve Wetlands," The Times of India, January 18, 2013. <http://timesofindia.indiatimes.com/city/guwahati/Task-forces-constituted-to-preserve-wetlands/articleshow/18071849.cms>

⁵ Das, B.N. (2012, 2009) The Land Laws of Assam, Guwahati: Assam Law House.

1.6.5 Reserved Forests

Assam's total recorded forest area (RFA) is 26,832 sq.km, including 17,864 sq.km of Reserved Forest and 8,968 square kilometres of Unclassified Forest (India, 2019). In terms of forest canopy density classes, the State has 1,444 sq.km very dense forest, 11,404 sq.km moderately dense forest and 14,825 sq.km open forest.

The forests in Guwahati can be classified into four categories: Reserve Dense Forest, Open Mixed Forest, Scattered Forest, and Degraded Forest with little or no vegetation. Reserve dense forests in Guwahati are notified forest and are declared as protected areas. Within the Guwahati Master Plan Area, there are seven Reserved Forests totalling 2,641 hectares, whereas a large portion of the forest has been encroached upon.

Table 1-14 List of Reserved Forest in Guwahati

SI No.	Name of the Forest	Area (Hectares)	Encroached	Percent
1	South Kalapahar	70	70	100
2	Fatasil RF	670	480	71.64
3	Jalukbari RF	97.70	10	10.24
4	Gota Nagar	171	130	76.02
5	Hengrabari RF	628	385	61.31
6	Sarania	7.99	3	37.55
7	Kalapahar (Partly)	996	467	46.89
Total		2640.69	1545	58.51

(Source: Divisional Forest Officer, Kamrup East Division)

According to the Forest Survey of India Report, 2001, just 32.89 % (1429 sq. km) of the entire geographical area of Kamrup district is covered by forest, with dense, open, and scrub forest covering 899 sq. km, 530 sq. km, and 52 sq. km respectively. The rapid development of human population, urbanisation, and industrialization are the underlying causes of the district's low forest covered area in general and Guwahati in particular (Rinku Manta, 2015).

1.7 Drainage and Slop Natural Drainage Channel:

Bharula and Basistha are two main natural drainage channels for Guwahati Metropolitan Region. Bharalu channel drains out in Brahmaputra, while Basistha channel outfalls to the Dipor Beel through Mora Bharalu channel. The Dipor Beel connects with the Brahmaputra through Konna Janstream. The Silsako Beel relates to the river via Bonda Jan stream.

The Brahmaputra riverbank is higher than most of the Guwahati city area, except the level of hills and wetland areas. As a result, during the heavy rainy days, gravity flow of storm water from the city does not outfall into the river; hence, lot of pumping required during monsoon.

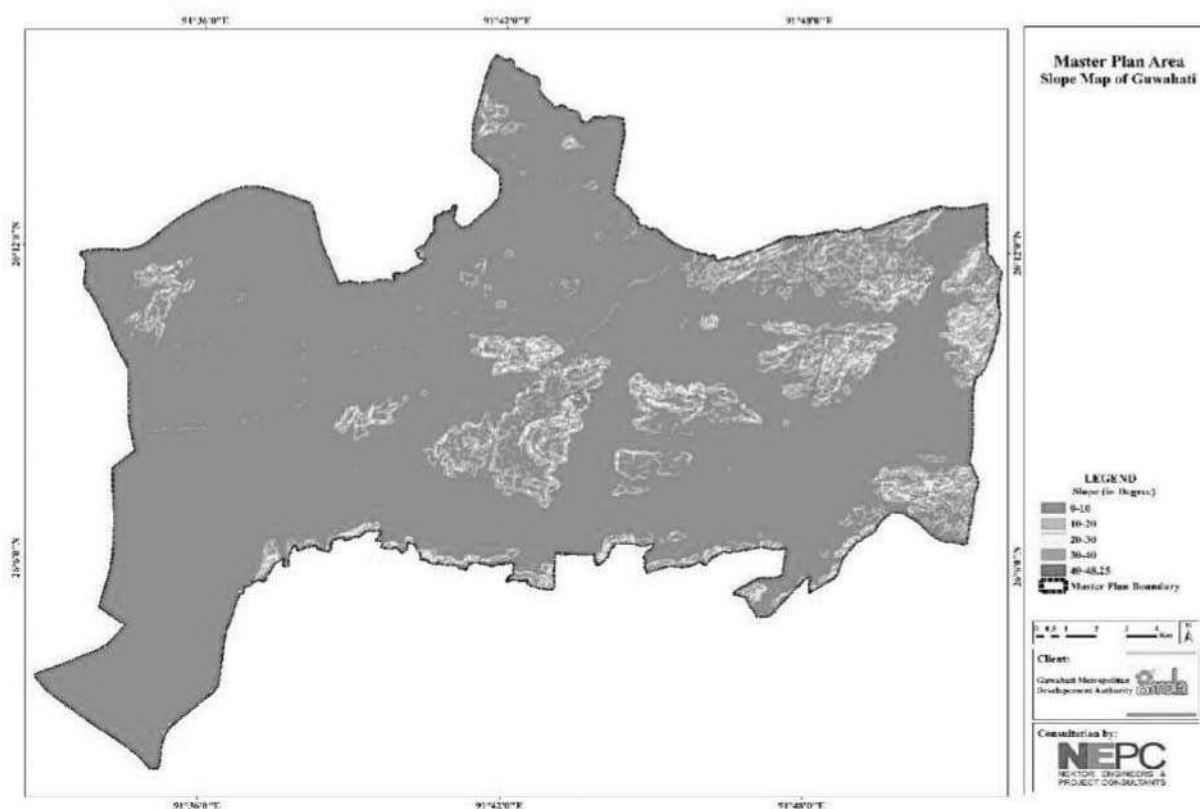


Figure 1-16 Slope Map

Around 85% of the MPA area is interspaced i.e. slope varies between 0-10%. Surrounding area of hillocks vary with slope range 20-30% which covers 10% of Master Plan Area. Maximum degree of slope falls in the bracket of >30 degree, which covers 2.8 sq.km of GMPA area and the average slop value of 20 to 24 degree as per digital slope model.

1.7.1 Drainage Basins of GMA

Overall drainage in the region is tackled at basin wise. In case of the flood, if the capacity of any basin is found inadequate then the floodwater is required to be diverted to another basin. Guwahati Metropolitan Region is divided into six drainage basins that are drained either directly or indirectly into the river. Following are the six drain basins in the region:

Dipar Basin: This is the largest single drainage basin with an area of 20,135 ha, comprising 2/3 hilly and 1/3 plain areas. It is located at the south most part of the region. River Basistha finally outfalls into this beel. The basin is sub-divided into two sub-basins- Bijubari sub-basin and Dipar sub-basin.

Bharalu Basin: With the catchment area of 42 sq.km, it is one of the important drainage basins in the region. However, the unplanned developments have blocked the natural drainage pattern in this basin, and so Bharula River is one of the flood prone areas in the region.

Silkaso Basin: Silsako basin covers 6,534 ha of area. It is in the east of Guwahati. The basin covers military area, refinery, and the townships of various industrial establishments; all these areas are slopping towards the beel. Silsako beel relates to the Brahmaputra River through Bondajan River.

Foreshore Basin: The basin mainly includes residential, commercial, institutional, and business areas of the region. Water logging is the issues in the certain low laying areas such as Uzan Bazar; rest of the areas are at a considerable at height and are safe from water logging issue.

North Guwahati Basin: The basin covers around 32 sq.km of area, comprising the north and western boundaries. Most of the area is hilly ranges. Eventually, the basin water drains into the river to Brahmaputra, directly or indirectly via either the Ghorajan River or Namalijalah Beel.

Kalmoni Basin: The basin is located outside the present boundary of the GMR area. The basin covers over all 66 sq.km of area. The outlet of Kalmoni River discharges into the Brahmaputra River partly through either Dipor Beel and Khana River or the Ngbhanga Beel and Khalbhog River.

Basic Problem and Remedial Measures:

Water logging in the city is the serious problem that the Guwahati Metropolitan Region is facing, especially during monsoons. Poor drainage system in the city is one of the causes for the water logging during the heavy rainy days. The drainage system in the city is not fully developed and is not updated for the past few decades. The drains are narrow, aided by soil siltation at the bottom of the drains, and blocked outlets of the drains at the river due to thrown garbage in the river. As a result, the floodwater overflows over the streets.

Presence of improper gravity flow of water to the river is another cause for the water logging in the city. During monsoons, the water level of the river rises above at which gravity flow takes place through the three outlets- Bharalu channel, Bonda Jan, Khona Jan, where sluice gates are used for prevention of backflow of water. Quite frequently, the sluice gates are kept close during the seasons of heavy rain; hence, the storm water is discharged by the set of pumps installed at the Bharalu sluice gates, which is a very dangerous condition.

In addition, the underground drains that carry wastewater from the residential, commercial, etc. areas should conceptually have gone to a sewerage system for treatment, instead has been discharged into the storm water drainage channels. Additionally, due to uncontrolled constructions, there have been encroachments in the natural drainage system.

(Adopted from: CDP and Master Plan-2025)

1.7.2 Soil Condition

Red loam, alluvial, and lateritic are three types of soil found in Assam. Garo, Mizo Hills, Cachar (part of), Khasi-Jaintia Hills and Sibsagar are red soiled areas, and part of Shibsagar, Jaintia Hills, Khasi Hills, Cachar (part of) and Nowga on are lateritic soiled regions; while alluvial soil covers entire Darrang, Kamrup, Lakhimpur, Goalpara, Sibsagar and part of Garo Hills. Overall, soils in the state are moderately to slightly acidic- more than 75% of the soils in the non-riverine area are acidic.

As mentioned earlier, the region is situated on an undulating plain, surrounded by hills on the southern and eastern sides. Removal of vegetation from the hills due to the construction activities and encroachments on hillside areas have resulted in exposing the surface, consequently into the soil loss. The problem of soil erosion is significant not only from the perspective of loss of soil fertility but also due to the related several environmental issues such as water logging, flash flood, siltation, decrease in the ground water table and the dusty environment on sunny days.

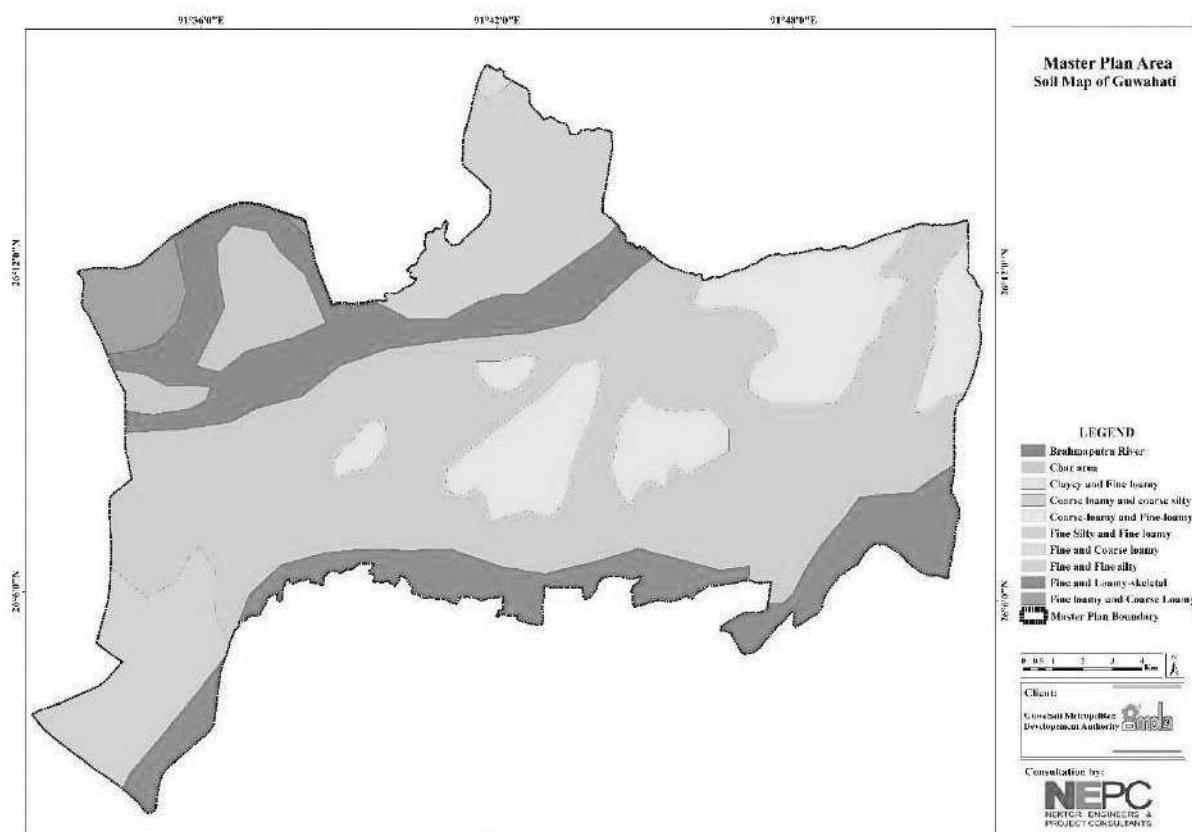


Figure 1-17: Soil Map

The soils of the area are basically the products of the fluvial processes of the Brahmaputra and its tributaries and composed of sand and clay in varying proportion. The plains are composed of coarse loamy and coarse silty which may be classified as new and old.

The new alluvial mostly from clayey to sandy loam in texture and is slightly acidic in reaction, deficient in phosphoric acid, nitrogen and humus, but rich in lime and potash. The old alluvium on the other hand occurs in the upper and middle parts of the valleys in the form of terrace deposits. These deposits contain alternating beds of pebbles, gravel or boulder with loose sand and clays. In certain parts, both the old and new alluvium are so combined that it is difficult to distinguish them. The old alluvium has relatively high percentage of acid and soluble

The riverbanks bear texturally three types of soil i.e., sandy loam, coarse loam, and clayey loam. These favour cultivation of winter rice, mustard, pea, vegetables, etc. Of the total riverbank area, 82.0% is arable, 7.0% is non arable land and 11.0% is not available for cultivation. As per the soil taxonomy classification of NBSS and LUP the soils are classified as association and grouped under 9 soil mapping units. The description of different mapping units along with percent area covered is given below

Table 1-15 Soil type and their area coverage in Guwahati MP area

Sl. No	Soil Classification	Area (Sq.Km)	% of Area
1	61-Coarse loamy and coarse silty	166.75	44.16
2	Char Area	14.39	3.81
3	Fine and Coarse loamy	0.74	0.19
4	Clayey and Fine loamy	57.37	15.19
5	Fine and Loamy-skeletal	35.89	9.50
6	32-Fine and Fine silty	23.85	6.32
7	31- Fine Silty and Fine loamy	30.72	8.14
8	Fine loamy and Coarse Loamy	8.88	2.35
Total		377*	100

(*including 49sq.km. Brahmaputra river area, Source: Department of Agriculture Assam, 1999)

Soil mapping unit 31 (Fine Silty and Fine loamy): Very deep, imperfectly drained, fine silty soils occurring on level to nearly level active flood plain having loamy surface with slight erosion and moderate flooding; associated with: Deep, moderately well drained, fine loamy soils occurring on level flood plain with moderate erosion and sever flooding.

Soil mapping unit 32 (Fine Silty, typic udifluvents and Typic Psammaquents): Moderatly deep, moderately well drained, fine silty soils occurring on level to nearly level active flood plain encompassing "Char" and "Chapari" having loamy surface with very severe flooding; associated with: Deep, well drained, sandy soils occurring on Char, Chapari and river islands of active flood plain with severe flooding.

Soil mapping unit 61 (Coarse Loamy Mollic Fluvaquents and Coarse Silty Aeric Fluvaquents): Moderately deep, moderately well drained coarse loamy soils occurring in level to nearly level active flood plain and on stable river islands having sandy surface with ground water table below 1 m of the surface and very severe flooding associated with deep imperfectly drained coarse silty soils occurring on nearly level active flood plain with moderate erosion and very severe flooding

The flood and erosion have been a major problem of Assam since 1950. During the last six decades, this problem has devastated the rural economy of Assam in a big way. As a result, Assam has not been able to come up to a certain standard of all-round development, particularly in the countryside. The flood and erosion have created a massive damage to its topography as well as the communication system.

(Source: Lok Sabha, House of People; Lok Sabha Debates, 2008)

<http://164.100.47.132/LssNew/psearch/result14.aspx?dbs|=10766>

1.8 Environment & Natural Hazards

1.8.1 Seismic Zone

The Brahmaputra Valley and its adjoining land constitute an extremely active seismic zone. Guwahati falls under Seismic Zone-V, where earthquakes of magnitude 8 or more can occur. The region had experienced the earthquakes of 8.7 magnitudes occurred in 1897 and 1950. Around 455 earthquakes measuring magnitude of 5 occurred between 1920 and 1980 in the region. Further, due to congestion brought by the topography, poor quality of construction, and narrow streets, the vulnerability to the seismic activity is exacerbated in the region. As earthquakes are one of the most dangerous and destructive natural hazards, which is also not easily predictable; preparation against them are difficult. Hence, the region calls for an attention to such natural disasters so that the required precaution steps can be undertaken.

1.8.2 Flood Occurrence in the Region

On the south bank of the Brahmaputra River, its five tributaries flow through the alluvial depression GMC area to meet at Bharalumukh. Bharula, Khanajan, and Bondajan, all these rivers eventually meet the Brahmaputra River. Due to blockage in the drainage system through Bharalu, Khanajan and Bondajan, backflow of the water from the Brahmaputra River cause frequent floods in the region during every summer. Over 40% of the GMC area is vulnerable to flood damage; around 32 Lakh hectare of area of the Brahmaputra valley is a flood prone area. Following are the main causes for the flooding and water logging of GMR.

- ***Natural Features of GMR***

Topography of Guwahati is significantly undulating, which is one the cause for the water logging. Lack of scope for gravity flow of floodwater to the river Brahmaputra throughout the year is the basic problem of drainage of Guwahati. During floods the river above the level at which gravity flow can take place; hence, the chances of backflow of the water from the river towards the drains is higher.

- ***Heavy Rainfall during Monsoons***

Around 80% of the seasonal rainfall occurs only in two months. Excessive silt carried by rainwater during monsoon generally deposited in the bed of existing drainage channel reducing the containing capacity of the channel and creating the submergence problem.

- ***Inadequate Drainage***

Both the natural and artificial drains are not capable of carrying the storm water effectively. Due to the lack of maintenance of the drainage system/channels, encroachment over swamps and natural drainage channels, dumping of garbage⁸, and heavy siltation, the capacity of drains have been reduced largely.

- ***Man-made Damages-Construction on Hillsides***

Cutting of hills slides for filling up the low-lying areas and large scale of deforestation are responsible for exposing hills, and consequently for the high rate of soil erosion; eventually, increasing the mudflow to the drainage channel, which has reduced the carrying capacity of the drainage system. In addition, construction of building and roads over the drains are responsible for the bottlenecking the drainage.

- ***Road Hierarchy***

Hierarchy of roads in the city starts from the main roads leading to various levels that are serving as feeder roads. Levels of these roads are in a gradient, starting from the higher to lower. However, due to the renovating or repairing works of the main roads, the levels of main roads are higher than the feeder roads. Hence, during the heavy flash floods, the water from the main roads spills to the low laying are, which is the feeder roads, and the drains are clogged.

1.8.3 Solid Waste Disposal

According to the 2011 census, Guwahati is the largest and fastest growing city in North East India, with a population of 9.6 lakh people and a growth rate of 17.53%. Guwahati metropolitan area has a population density of 34 person per hector, and trash disposal is becoming increasingly problematic.

The Guwahati Municipal Corporation (GMC), which oversees day-to-day operations and affairs such as primary collection, secondary collection, home composting, processing, and disposal of solid waste, oversees waste management. With a population of nearly a million people, the city is divided into 60 wards, each of which is assigned to a non-profit that oversees doorstep collection, street sweeping, and user fee collection. The city generates over 550 tonnes of solid waste per day (TPD), with more than 85% of that going to the Boragaon dumpsite, in addition to the several smaller tiny garbage vulnerable points seen throughout the city. This is due to rapid

population expansion, widespread movement of people from rural to urban areas, and a general increase in economic activity within the city.

Boragaon, Guwahati, has a 50 TPD windrow technology compost facility. It has been operational since 2010, and a proposal has been made to increase its capacity to 200 TPD. To encourage the separation of municipal solid garbage, GMC launched an initiative to purchase dry waste from its inhabitants (MSW). Pilot programmes are being used to raise awareness and encourage household composting. GMC in association with the Indian Institute of Technology-Kharagpur is constantly working to improve Guwahati's municipal waste management system. Despite these efforts, Guwahati came in at 356th place in the Swacch Survekshan 2020 assessment, which examines cleanliness, hygiene, and sanitation in villages, cities, and towns across India.

Though the city has measures for solid waste disposal and management, they are insufficient, and because of the lack of an efficient solid waste disposal system, individuals tend to discard plastics and other waste into open drainage, clogging drains.

1.8.4 Land Slides

Landslides are other severe form of natural disasters. Landslides are the movement of rock or debris of hills down the hill's slopes. Occurrence of the landslides is geological phenomenon, which includes the failure of the material that makes up the hills slope and is driven by the force of gravity. Scale of destruction due to this natural disaster depends on the location of the landslide. Landslides can occur in any unstable hilly terrain, and take a variety of forms; hence, predicting the landslides is a tough and complex task. The landslide hazards, in general, cannot be completely prevented; however, the intensity and severity of their impacts can be minimized if the problem is recognized before the development or deforestation begins.

Guwahati features a considerable number of dissected hills throughout the city, according to geomorphology. There are eight major hill series in Guwahati namely (1) Nabagraha and Sunsali hill series (2) Japorigog hill (3) Sonaighuli and Jutikuchi hill series (4) Narakashur hill (5) Nilachal hill (6) Fatasil hill (7) Jalukbari hill (8) Khanapara hill (9) Agyathuri hills. The nature of these hills is particularly erosive, resulting in the incidence of landslides in the area. The slopes of these hills are moderate, but because

to the lack of vegetation cover, they are quite fragile. The region's forest cover has shrunk, and it now falls under the Forest Blank category of the NRSA classification. Because of the sparse vegetation cover in these forests, the upper surface has been exposed to erosion agents. Rock fall landslides can also occur in areas where there are no scrubs. Rainfall is one of the most important triggering elements in the region since it has resulted in the occurrence of landslides (Suman Das, 2014). Guwahati lacks a properly built hilly region drainage network, which has resulted in increasing topsoil erosion from city hills, as well as slope failure. Unfortunately, many of the area's most vulnerable to landslide hazards are populated by the economically vulnerable, who suffer the most because of landslides because they lack the finances or ability to organise rehabilitation efforts on their own.

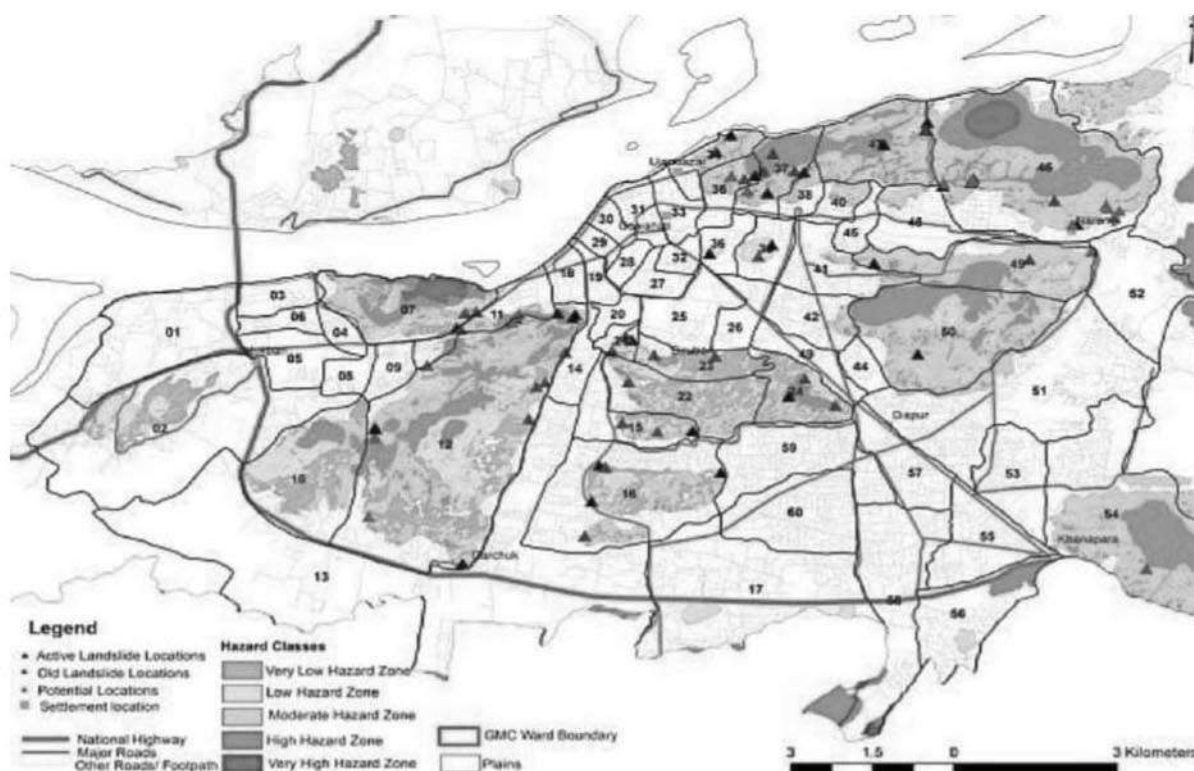


Figure 1-18 : Landslide Hazard Zonation Map of Guwahati municipal area (Source: IIT Guwahati)

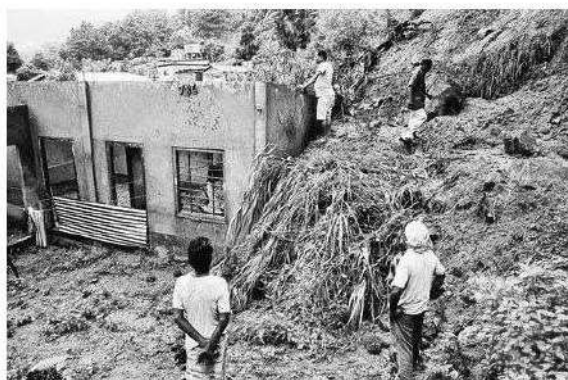


Figure 1-20 Landslide at Nizarapar, Guwahati (June 2018)



Figure 1-19: Landslide at Gitanagar (June 2020)

The terrain of Guwahati is characterised by steeply sloping hills and loose, unconsolidated soil. Due to population demands, hillsides have been chopped carelessly. Every year during the monsoons, landslides in hill villages occur, resulting in several deaths. During the month of September 2014, landslides occurred in several hills, including Kharguli and Lalmati, because of three-day rains. In Ganeshpur, a young man was killed when a landslide and a mountain of debris entered his chamber in the middle of the night, leaving him no time to flee.

1.9 Protected Area

Guwahati Metropolitan Region has large areas under hills, forest, and wetlands. However, due to high intensity of urbanization, these are under tremendous pressure. These areas were categorized as eco-sensitive zone in the earlier CMP-2025. The existing master plan suggested conserving the areas with no urban developments.

Forest: Reserve dense forests in Guwahati are notified forest and declared as protected areas. There are seven reserve forests which falls within the boundary of GMDA.

Hills: The southern and eastern sides of the city are surrounded by hills. The central part of the city also has small hillocks namely Sarania hill (193 m), Nabagraha hill (217 m), Nilachal hill (193 m) and Chunsali Hill (293 m).

Wetlands: Wetlands in the city are in the form of lakes, ponds, and low-lying marshes. There are four notified major beels (wetlands) in the city namely: Dipor Beel, Sarusola and Borsola Beel, Bonadajan and Silsako Beel.

Wildlife Sanctuaries: There are two notified wildlife sanctuaries fall under existing GMDA area, namely Deepor Bill Wildlife Sanctuary and Amchang Wildlife Sanctuary.

Table 1-16: List of Archaeological Sites in GMR

Name of Monuments/ Sites	Location	District
Carvings, Inscriptions, and pillar on the	Urvasi Island	Kamrup
Rock-cut sculptures representing Vishnu Janardan	Guwahati	Kamrup
Duargaril a Rock inscription	Kamakhya Hill	Kamrup
Rock-Cut Figures Dancing Bhairva, Figures of Ganesa-2, Figure of Narakasur, Four-handed Bhairavi, Miniature Sikhara Shrine, Sivalingas-12, Stone Gateway, Two- handed Bhairavi	Kamakhya Hill	Kamrup

Source: Archaeological Survey of India; http://asi.nic.in/asi_monu_alphalist_assam.asp

1.10 Conservation of Natural Resources and Heritage

The region is rich in cultural and historical heritage. There are number of archaeological and architectural sites of historical importance. The creation of conservation zones is important to integrate the overall conservation of the area. Following are the archaeological sites in the region:

Following are the conservation zones have been identified in the Master Plan for Guwahati Metropolitan Area-2025

- Kamakhya Temple Zone
- Brahmaputra River Temple Zone- Umananda Temple, Janardhanan Temple, Sikh Temple (Fancy Bazaar)
- Vasistha Ashram Complex

Archaeological and architectural heritage of Guwahati is required to be protected, nurtured, and passed on to the coming generation. For this purpose, the plan proposes to establish a Heritage Conservation Committee (HCC) by the State Government. The HCC shall prepare a list of State Level Environment Impact Assessment Authority.

1.11 Need for the Master Plan

A town/city and its surrounding areas are composed of land, buildings, people, utilities and transportation and communication facilities, drainage, markets etc. A Master Plan is a statutory instrument for controlling, directing and promoting the sound and rational development or redevelopment of an urban area and its adjoin areas within a view to achieving maximum economic, social and aesthetic benefits.

The Master plan is a long-term perspective plan intended to guide the growth and development of a city or a region. It is a document that describes, in narrative and with maps, an overall development concept including both present uses as well as future land development plans. The Master plan provides allocation of land in view of the space requirements coming up in future years. It also sets out strategies and measures to be adopted for the facilitation of commercial, industrial, residential, tourism-related, recreational, and other investments and provide for the development of urban infrastructure of the desired standards for improved quality of life.

The Master Plan consists of co-ordinated plans of major streets, transportation facilities, parks, recreation facilities, educational facilities, health facilities, tourist facilities, public utilities, physical infrastructure, commercial and industrial areas – all

arranged in such a way which would function most efficiently and economically and also enhance the aesthetic beauty not only of the urban area but also the village area at the same time. It is also an important tool for guiding and regulating the future growth of the town.

The Master Plan provides vision, direction and a defined achievable future for the Town by establishing specific goals and strategies for land use; community appearance and design; housing and neighbourhoods; jobs and economic vitality; transportation; public services and facilities; natural resource protection; open space and recreation; history, arts and culture; and regional coordination.

A Master Plan is needed for the proper physical development of a city. It is needed to guide how we may use space and manage competing demands of space in future thereby ensuring a better Guwahati for tomorrow. It may be noted that it was agreed in a Workshop held at the National Level in 1995 sponsored by the Ministry of Urban Development, Government of India that the alternative to a Master Plan is a “better Master Plan.”

The first Master Plan of Guwahati was prepared long back in the year 1977 and lastly revised in the year 2009 which will be applicable up to the year 2025. As such it is necessary to revise the Guwahati Master Plan by adopting new GIS based technology under the scheme of AMRUT (Atal Mission for Rejuvenation and Urban Transformation) to provide better guidelines for the balanced development of the existing area as well as to incorporate new areas in the Master Plan.

1.11.1 The objectives of the Existing Master Plan for GMA- 2025

- To suggest measures for planned development
- To give broad land use pattern considering the potential growth and emerging needs of the area.
- To facilitate commercial, industrial, residential, tourism, recreational activities and other investments
- To provide urban infrastructure of desired standards for improved quality of life
- To evolve an effective implementation strategy
- To prepare a comprehensive Master Plan with public participation by conducting workshops, seminars and discussions.
- To develop a Base map and digital GIS database of urban cadastres of GMA.
- To generate the Land Information System for GMA by integrating the cadastral, land use & plan information.

1.11.2 Stages of Master Plan Preparation

The Comprehensive GIS Based Master Plan for Guwahati Metropolitan Area would be prepared in four stages as follows:

Stage I: Inception Report (Already Completed)

At this stage the consultants mobilize the project team and conduct a site reconnaissance survey based on which the major issues for the development of the city are identified and the database requirement formulated. The consultant also submits a system requirement study for the Land Information System.

This stage has already been covered by the Consultants.

Stage II: Spatial attribute collection and vetting of Base Map (Already Completed)

The NRSC will provide a draft base map at 1:4000 scale using high resolution satellite data. To provide authenticity to the information provided by NRSC, value-addition of spatial features will be done through collection of attributes and the same will be vetted by ULBs/ STPD for further usage. The layer-wise spatial attributes as per the proforma given in Design & Standards will be collected from the field by the Consultant and provided to NRSC for incorporation so that the draft final base map can be generated. The draft base maps are to be sent back to NRSC to incorporate the attributes collected by the consultants on GIS database and generate draft final base maps. NRSC, after incorporating spatial attributes, will send the final maps generated to the competent authority/ ULB/ STPD for vetting, after which the final base maps will be generated which will be used as an input for plan formulation.

Stage III: Data Analysis Report (Already Completed)

After the submission of the inception report, an extensive data collection – both primary and secondary is conducted. Several primary surveys like traffic and transportation surveys, socio-economic household surveys, environmental impact survey and wholesale market surveys are conducted during this stage. Overall ground situation in different aspects of City development has been covered in this report. Along with this, the detailed analysis part of Demographic and Economic aspect of city has been integrated in this report. The pre- planning consultative workshop is to be held during which an attempt shall be made to get ideas for the development of the city from the participants who are stakeholders in the development of the city.

Stage IV: Project Requirement, Issues and Potential Report

This is the next important step towards plan formulation. During this stage detailed analytical studies for different sectors like traffic and transportation, physical and social infrastructure, housing and slums, urban land use etc are conducted. The entire study will be incorporated in separate chapters targeting the requirements, issues and the potential of each sector in city.

Stage V: Comprehensive Draft Master Plan Report

At this stage, the Consultant prepares draft proposals after planning studies, consultative workshops with various stakeholders and local bodies. The draft proposals will be in accordance with existing regional plans, district plans and will incorporate proposals of other departments of State as well as Central Govt. At this stage the consultants identify a suitable platform for development of customized GIS based Land Information System (LIS). The software will incorporate features such as plot information, road network, contours, infrastructure network, land use, built up area etc for fast and effective information retrieval and presentation.

Stage VI: Draft Master Plan

The draft master plan would address the relevant issues pertaining to zoning plans and also workout a strategy for implementation of the plan and monitoring system. The same shall be submitted to GMDA for their comments / suggestions. The draft master plan will specify the aims and objectives for the development of the city/ town. Contents of the draft master/ development plan document will be as per URDPFI Guidelines and statutory provisions of the Town & Country Planning Act, 1959. The consultant shall modify Upgrade the Draft Land Information System by incorporating suggestion/ comments/ improvements raised by GMDA and submit the Final Land Information System along with Comprehensive Master Plan for Guwahati Metropolitan Area.

1.11.3 Preparation of Base Map

1.11.3.1 Updating the Base Map of the GMDA Area

Updating the Base Map started based on the Base Map and other relevant maps available with GMDA. In addition, images such as topography sheets, satellite images and such other relevant maps had been procured to extract information about the basic features of the land.

The purpose of updating the base map is to delineate the existing administrative boundaries and clearly demarcate the natural and physical features of the New Metropolitan Region. The updated Base Map demarcated the spatial spread of built-up land, vacant land, scrubland, vegetation cover, land under agriculture use, forests, rivers and other water bodies based on aerial/ satellite imagery and relevant secondary data. The details of Coastal Regulation Zone line, trunk network of water supply, main power transmission lines shall also be mapped by studying various relevant secondary information.

1.11.3.2 Data Source

Many data had been procured and extracted from various sources for preparation of the Base Map. The following table listed all these sources, the features extracted and their uses in Base Map preparation process.

Table 1-17 Data sources for Map and Georeferencing

Spatial Data	Sources	Features
Topo Sheets- 1:50,000	Survey of India	Natural features like rivers, wetlands, water bodies
District Maps	Administrative Atlas (Census 2011)	Administrative boundaries for each administrative units falling within the proposed GMR
SRTM Image (2005)	Satellite Images (NRSC)	Using for Geo-referencing cadastral maps Using while conducting existing land use survey Extract- railway line, water bodies, water bodies
Cadastral	Procured from GMDA & survey offices for each villages and urban centers falling within the GMDA.	Village/survey boundaries along with survey numbers. Spatial coordinates, major roads & railway line

1.11.3.3 Methodology

- **Geo-referencing of Revenue Maps**
All scanned images were converted to Tiff for geo-referencing and GCPs were identified on Satellite image and revenue maps. These images were registered using these GCPs. In many cases, we did not find enough no. of GCPs as land use and other physical features are completely changed in these areas now.
- **Digitization of Revenue Plots and Nos.**
All lines of plots, roads and rivers were digitized after that and a unique no. was assigned to each polygon. "Blank" has been marked for the polygon where no numbers are found in revenue maps.
- **Edge Matching**
The GIS team will clean up all edges of villages after matching to make single boundary between adjacent villages.
- **Quality Check and Cleaning & Editing of Maps**
All maps were thoroughly checked for digitization of all features and appropriate no. of plot. The team cleaned and edited all maps at the end to finalize Base map. Received Revenue maps of Kamrup Metropolitan area in digitized form but there were no plot nos. assigned with plots. In addition, received revenue images for few villages and assigned nos. from these images.

2. DEMOGRAPHY

2.1 Demographic Characteristics

2.1.1 Total Population

Demography is the study of human population such as size, growth, density, distribution, and vital statistics. It helps to understand population dynamics by investigating three main demographic processes in Guwahati. It is essential that a good understanding of a population dynamics provide the basis for decision-making, policy development and planning. Social and economic development processes and outcomes are depended upon the detailed study of population characteristic of any planning area.

Table 2-1 Existing population of Masterplan Area 2011

Sl. No.	Existing Master Plan Area	Population (2011)	Percent
1	GMC (60 Wards)	957352	83.85%
2	Narengi Outgrowth (OG)	4982	0.44%
3	8 CT (Census Towns)	59497	5.21%
4	North Guwahati (4 Wards)	10328	0.90%
5	79 Rural Villages	109540	9.59%
TOTAL Population		11,41,699	100%

(Source: Census of India, 2011)

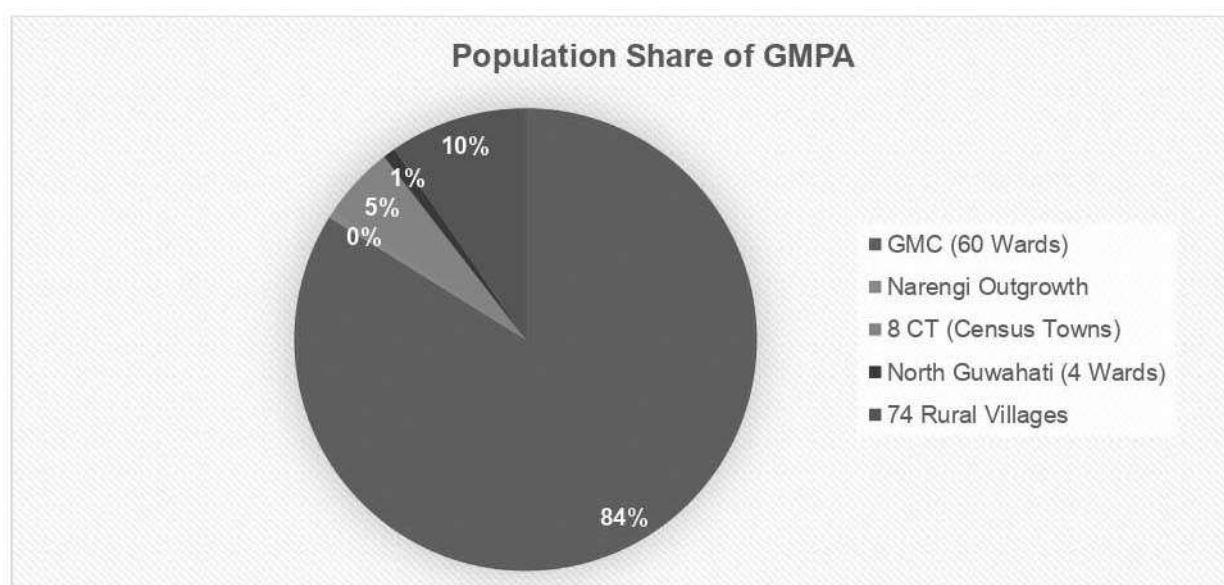


Figure 2-1 Population distribution of Guwahati Planning Area, 2011

The total population of Guwahati Planning Area as per Census 2011 is 11,41,699, out of which population of GMC Area is 9,62,334 that comes to 86.46% of the total population. Rural areas including Semi-Urban villages and the villages of East and West circles consists population of 1,09,540 of about 7.23%. North Guwahati Municipal Board and Census Towns contain population of 69,825, which is about 6.31% of the total planning area population.

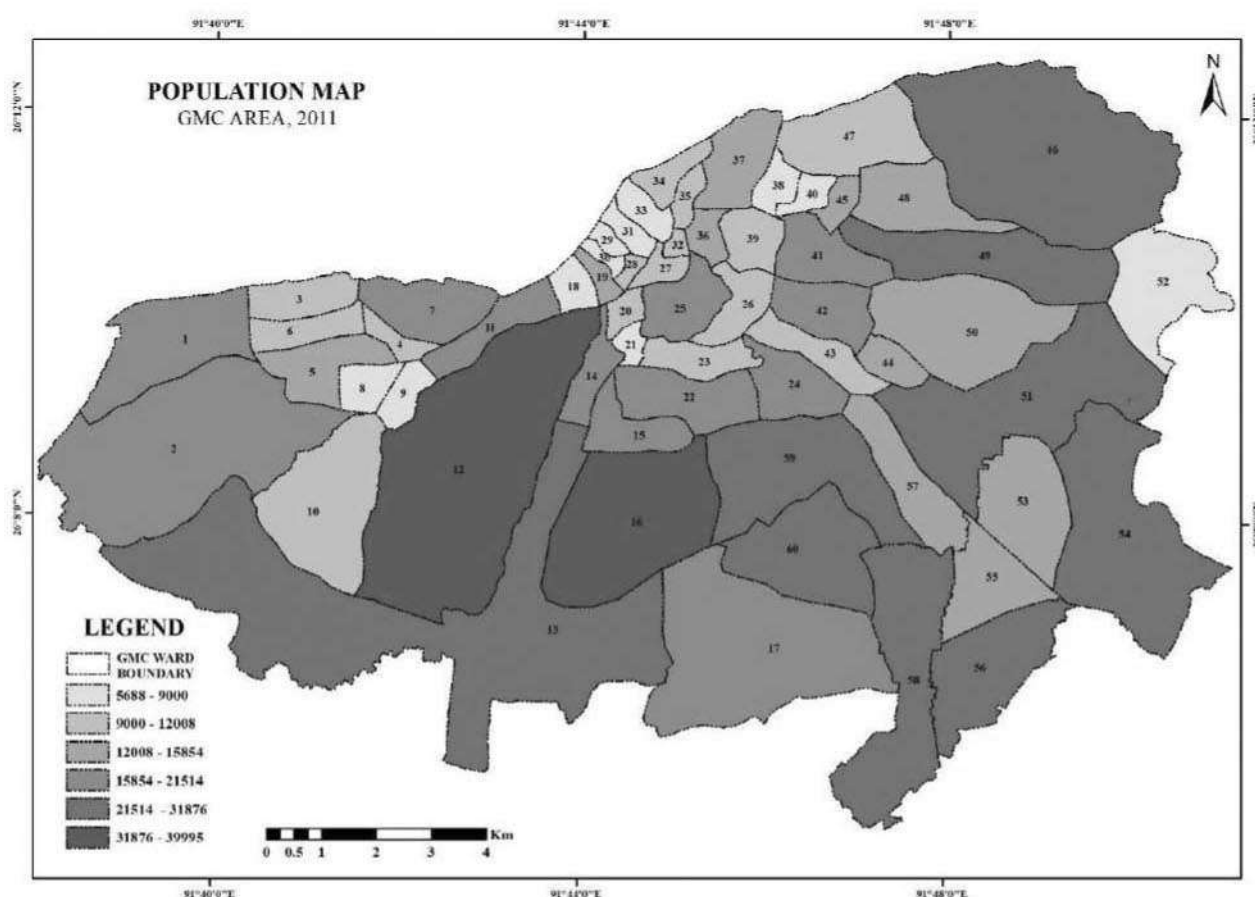


Figure 2-2 Ward wise Population distribution of GMC area

It can be inferred from the above figure that the Wards 12 and 16 comprises highest population as 39995 and 39056 respectively in GMC area whereas Ward no. 9 and 30 having least population i.e. 6746 and 5688.

2.1.2 Male/Female Population

Table 2-2 Ward wise Population for Municipal area

Ward No.	Population			Ward No.	Population		
	Total	Male	Female		Total	Male	Female
1	16692	8547	8145	31	7387	4100	3287
2	16613	8780	7833	32	10332	5417	4915
3	11106	5666	5440	33	8368	4455	3913
4	10731	5424	5307	34	11088	5497	5591

5	12526	6357	6169	35	11012	5527	5485
6	10171	5086	5085	36	13966	7336	6630
7	20366	10368	9998	37	15854	8224	7630
8	7593	3856	3737	38	8589	4429	4160
9	6746	3164	3582	39	11574	5690	5884
10	10216	5204	5012	40	7782	4023	3759
11	18514	9508	9006	41	21514	11008	10506
12	39995	20657	19338	42	16649	8519	8130
13	29041	14985	14056	43	9295	4757	4538
14	17629	9252	8377	44	15073	7884	7189
15	19228	9843	9385	45	12537	6597	5940
16	39056	20100	18956	46	28309	14923	13386
17	21292	11083	10209	47	9772	5147	4625
18	7431	3916	3515	48	12686	6565	6121
19	14957	7825	7132	49	30124	15540	14584
20	11887	6405	5482	50	14084	7446	6638
21	7718	4171	3547	51	30057	15417	14640
22	21169	10629	10540	52	9000	4697	4303
23	10837	5604	5233	53	14890	7812	7078
24	17830	9071	8759	54	24226	12572	11654
25	20707	10771	9936	55	13670	7070	6600
26	10431	5329	5102	56	26625	13797	12828
27	12008	6172	5836	57	13359	6859	6500
28	9828	5270	4558	58	31876	16838	15038
29	6988	3754	3234	59	25709	13335	12374
30	5688	2929	2759	60	26951	14155	12796
TOTAL					957352	495362	461990

(Source: Census on India, 2011)

2.1.3 Population Growth Rate

2.1.3.1 GMC Population Growth

Table 2-3 GMC population growth trend

Year	Decadal Growth Rate	Total Population (GMC+OG)
1941	35.79%	29598
1951	47.36%	43615
1961	212.37%	136239
1971	47.08%	200377
1991	191.62%	584342
2001	40.12%	818809
2011	17.53%	962334

(Source: Census of India)

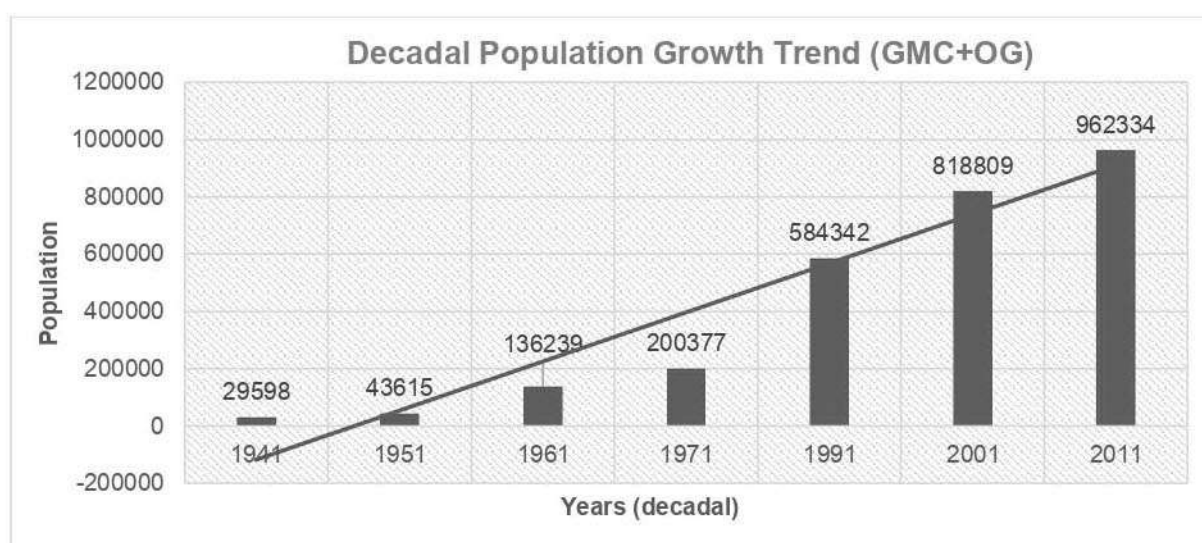


Figure 2-3 Decadal Population Growth of GMC+OG

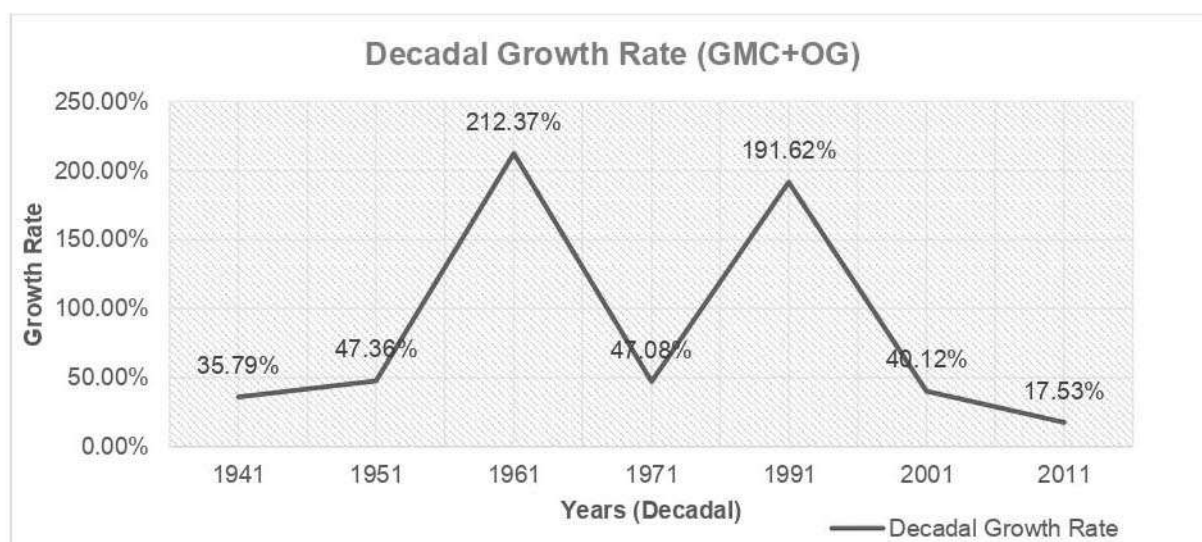


Figure 2-4 Decadal Pop. Growth rate of GMC+OG

Table 2-4 Population Increase and Decadal Growth Rate

Year	GMC		GMDA (Excluding GMC)		GMDA	
	Population	CAGR (%)	Population	CAGR (%)	Population	CAGR (%)
1951	43615	-	53774	-	97389	-
1961	136239	12.1	63243	1.6	199482	7.4
1971	200377	3.9	92842	3.9	293219	3.9
1981*	268945	3	166335	6	435280	4
1991	584342	8.1	61827	-2.9	707955	5
2001	818809	3.4	71964	3.3	990161	3.4
2011	962334	1.6	179365	0.5	1141699	1.4

(*No census conducted in Assam the numbers projected considering trend, Source: Census of India)

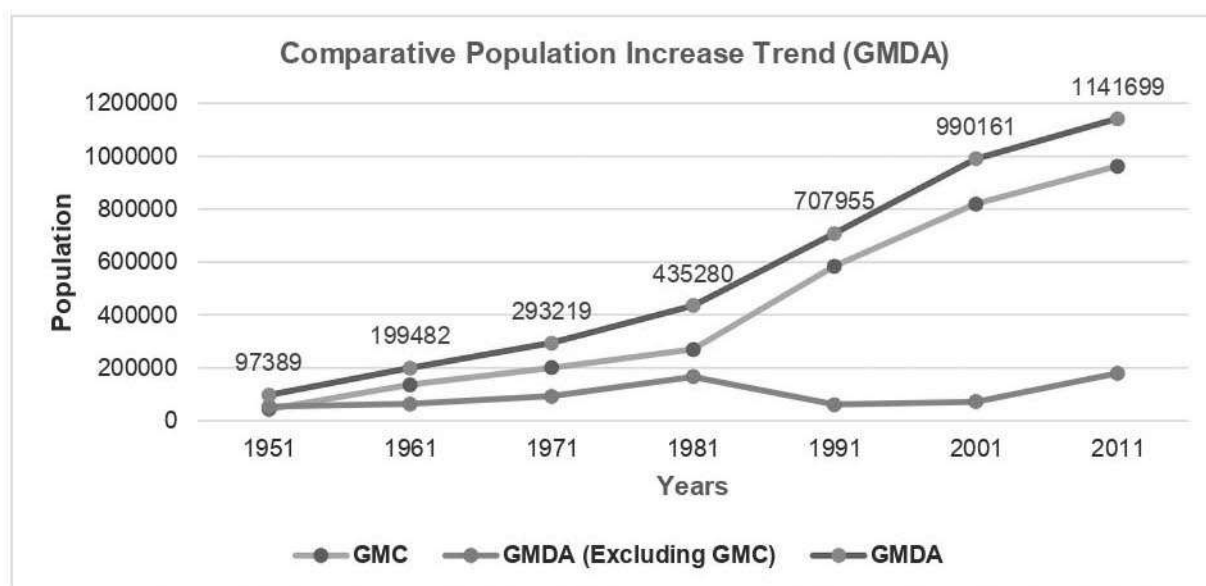


Figure 2-5 Population growth trend of last six decades

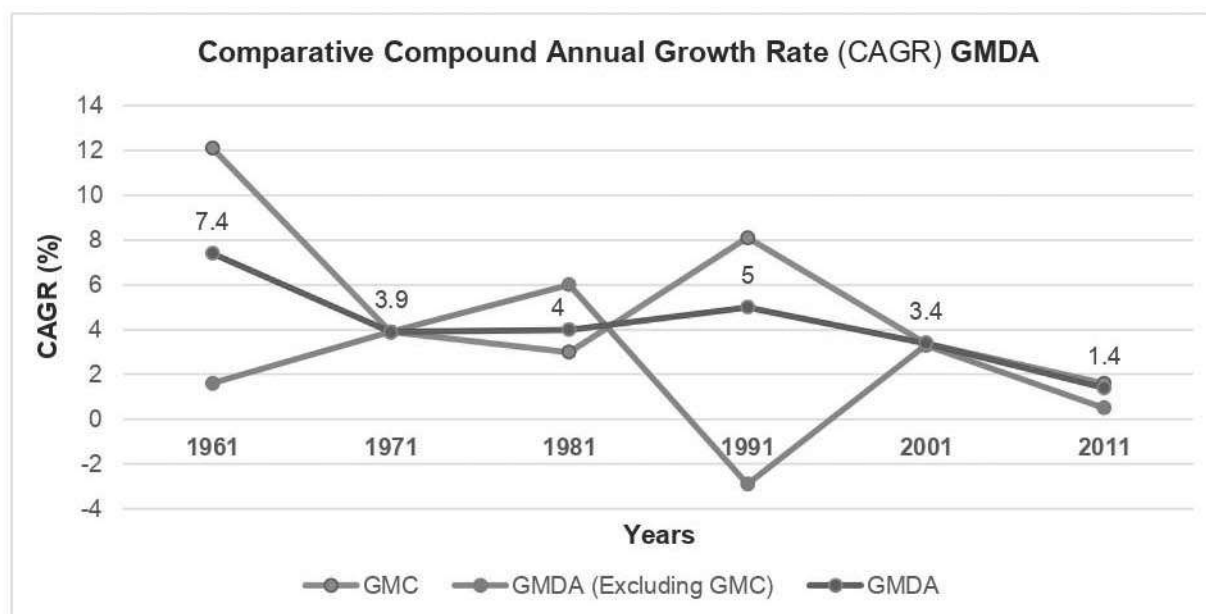


Figure 2-6 Comparative Population growth rate of last six decades

Table 2-3 represents the increase in numbers of total population of GMC area & relative population growth rate trend of past six decades. The table clearly reveals that the GMC area witnessed a high growth rate of almost 212.37 percent in the period 1951-61. During the period 1961-71 GMC area recorded a decadal growth rate of 47.08%. However, the Census population count was not carried out in Assam in year 1981 for the Decade 1971-81, the growth rate was considered as 191.62% of two decades for 1971-91 thereafter sudden downfall in growth rate was observed throughout the GMC region for year 2001. After this drop-in growth rate, the GMC area observed further moderate downfall in 2001-11 period with a moderate increase in

population up to 962334 with decadal growth rate of 17.53%. This is attributed to the fact that Guwahati is attracting a lot of population in the working sector due to top priority given by the administration along with improvements in social security in the systems.

2.1.3.2 GMDA Decadal Population Growth Rate

Table 2-5 Decadal Population Growth Rate (GMDA, GMC, Rural)

Year	GMC		GMDA (Excluding GMC)		GMDA	
	Population	DGR (%)	Population	DGR (%)	Population	DGR (%)
1951	43615	-	53774	-	97389	-
1961	136239	212.4	63243	17.6	199482	104.8
1971	200377	47.1	92842	46.8	293219	47.0
1981	268945	34.2	166335	79.2	435280	48.4
1991	584342	117.3	61827	-62.8	707955	62.6
2001	818809	40.1	71964	16.4	990161	39.9
2011	962334	17.5	179365	149.2	1141699	15.3

(Source: Census of India, Compiled by consultant)

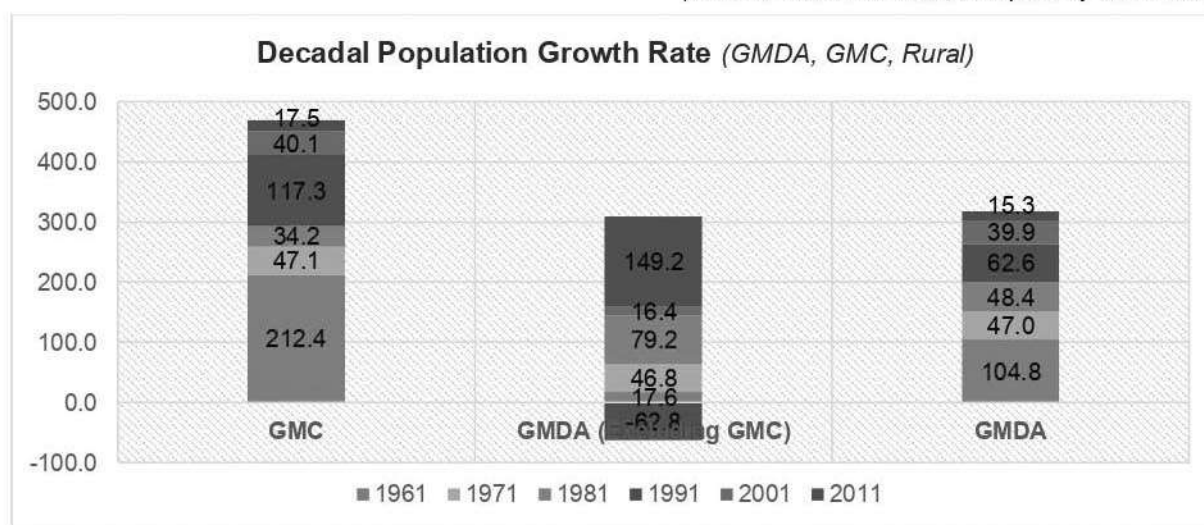


Figure 2-7: Decadal Population Growth Rate in GMPA

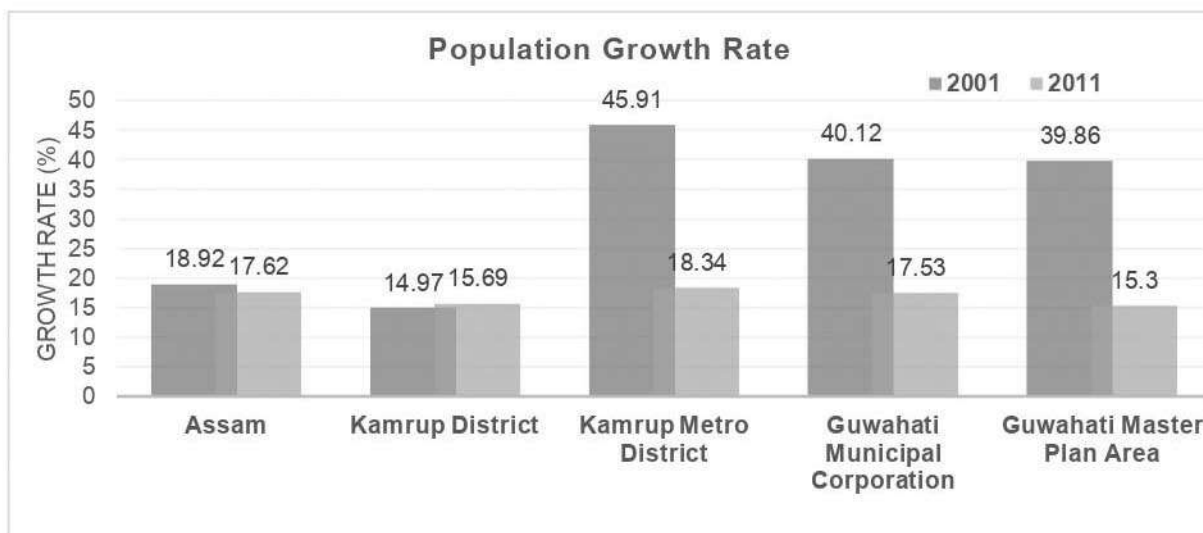
2.1.3.3 Comparative Growth Rate of GMPA with State and District

Table 2-6 Comparison of Growth Rate

Particular	Growth rate %	
	2001	2011
Assam	18.92	17.62
Kamrup District	14.97	15.69
Kamrup Metro District	45.91	18.34
GMC+OG	40.12	17.53
Guwahati Master Plan Area	39.86	15.30

(Source: Census of India, 2011)

Figure 2-8 Comparative Growth rate of GMPA with Districts and State



2.1.4 Population Density

The Guwahati Master Plan area comprises of total area of 382 sq.km with a total population of 11.41 Lakhs.

Table 2-7 indicates that the overall population density of the Guwahati Master Plan area is 35 PPU (Persons Per Unit) in 2011. Here, 1 hectare of area is considered as single Unit for population density. The highest density is in GMC area which is around 54 PPU and minimum density is in villages which is around 9 ppu. Moreover, 8 Census Towns have population density of 23 person per unit, whereas rural area has a population density of 9 person per unit only.

It is observed from the table that the average population density of Guwahati Master Plan area is 35 PPU as of 2011 and it is comparatively higher in core city area which is reducing as we shift to less urbanized area.

Table 2-7 Population Density for different regions of Master Plan area

Sl. No.	Particulars	Area (sq.km)	Population	Population Density (person/ha)
1	GMC (60 Wards) + 1 OG	178.24	962334	54
2	8 CT (Census Towns)	25.71	59497	23
3	North Guwahati (4 Wards)	3.34	10328	31
4	79 Rural Villages	120.71	109540	9
Total GMPA 2045		328	1141699	35

(Source: Census of India, 2011 and Consultant Compilation)

From Table 2-8 of Guwahati Ward wise population density data, it is found that Ward no.32 is the densest comprising 55349 persons per unit and Ward no.2 is the least with 1546 person per unit.

Table 2-8 Guwahati GMC area Ward wise population density

Ward No.	Population Density			Ward No.	Population Density		
	Area (sq.km)	Population	Density (person/sq.km)		Area (sq.km)	Population	Density (person/sq.km.)
1	3.94	16692	4238	31	0.46	7387	15917
2	10.75	16613	1546	32	0.19	10332	55349
3	1.31	11106	8509	33	0.65	8368	12816
4	0.52	10731	20758	34	0.74	11088	14975
5	1.79	12526	7003	35	0.45	11012	24599
6	1.10	10171	9223	36	0.58	13966	23975
7	2.17	20366	9391	37	1.86	15854	8508
8	0.80	7593	9515	38	0.63	8589	13640
9	0.73	6746	9293	39	1.10	11574	10498
10	4.74	10216	2154	40	0.48	7782	16350
11	1.47	18514	12573	41	1.80	21514	11932
12	13.65	39995	2930	42	1.74	16649	9587
13	19.61	29041	1553	43	1.36	9295	6835
14	0.98	17629	18057	44	0.77	15073	19465
15	1.45	19228	13281	45	0.50	12537	24900
16	6.87	39056	5685	46	11.75	28309	2356
17	9.34	21292	2506	47	3.07	9772	3186
18	0.62	7431	12008	48	2.34	12686	5427
19	0.38	14957	39753	49	4.32	30124	6968
20	0.43	11887	27598	50	5.11	14084	2757
21	0.33	7718	23254	51	8.05	30057	3632
22	2.37	21169	8944	52	3.29	9000	2383
23	1.17	10837	9265	53	3.22	14890	4629
24	1.76	17830	10135	54	7.63	24226	2861
25	1.63	20707	12717	55	2.27	13670	6017
26	1.18	10431	8837	56	3.74	26625	7126

27	0.47	12008	25464	57	2.36	13359	5667
28	0.20	9828	49762	58	5.92	31876	5914
29	0.26	6988	27219	59	5.51	25709	4670
30	0.22	5688	25778	60	4.15	26951	6497

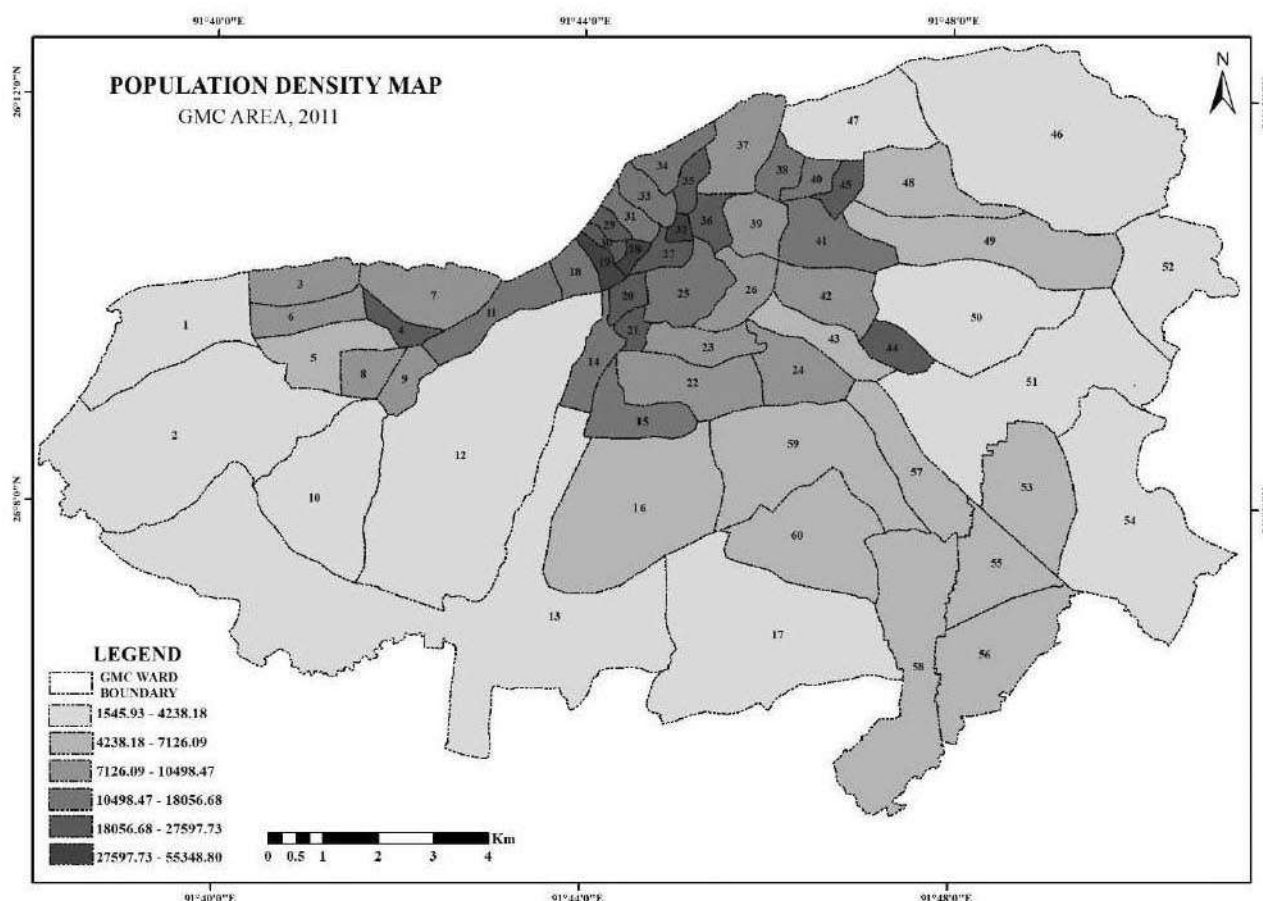


Figure 2-9 Ward wise Population density Map of Guwahati MB area

2.1.5 Sex Ratio

The project area has ratio of 934 female per 1,000 male populations, while Kamrup Metropolitan district records of 936 females per 1,000 males. At revenue circle level, North Guwahati and Sonapur in Kamrup Metropolitan district record the highest sex ratio of 981 and 971 respectively. At the same time, Azara (915) RC has respectively lowest sex ratio as compared to the other RCs in the region, which indicates that these RCs have more male population as compared to female.

Table 2-9 Sex ratio of India

S. No	Country	year	2001	2011
1	India	Sex Ratio	933	940

(Source: Census of India 2001 & 2011)

Table 2-10 Regional Comparison of Sex ratio

Region	Sex ratio
India	940
Assam	958
Kamrup Metro District	936
GMC	931

(Source: Census of India 2011)

Table 2-11 Sex ratio of GIS based Master Plan area

Sl.No	Description	Population	Sex Ratio
1	GMC (60 Wards) + 1 OG	962334	931
2	8 CT (Census Towns)	59497	969
3	North Guwahati (4 Wards)	10,328	1030
4	79 Rural Villages	109540	939
Total for GIS based Guwahati Master Plan		1141699	934

(Source: Census of India, 2011 and Consultant Compilation)

Observations from the Table 2-11 have concluded that the Female population is higher in North Guwahati compared to male population, whereas it is lower in rural area.

2.1.6 Literacy rate

Table 2-12 Literacy rate in Guwahati GIS Based Master Plan area

Sl No	Description	Popula tion	Pop. (less 0-6 age)	Actual Lit. Pop.	Male Lit.	Female Lit.	% of Total Lit.	% of Male Lit.	% of Female Lit.
1	GMC (60 Wards) + 1 OG	962334	871698	797613	425837	371776	91.50	85.43	80.14
2	8 CT (Census Towns)	59497	53746	46838	24888	21950	87.15	82.36	74.97
3	North Guwahati (4 Wards)	10,328	9544	8941	4508	4433	93.68	88.60	84.60
4	79 Rural Villages	109540	100723	80919	44386	36533	80.34	78.56	68.87
Total		1141699	1031870	934311	499619	434692	90.55%	84.64%	78.83%

(Source: Census of India, 2011)

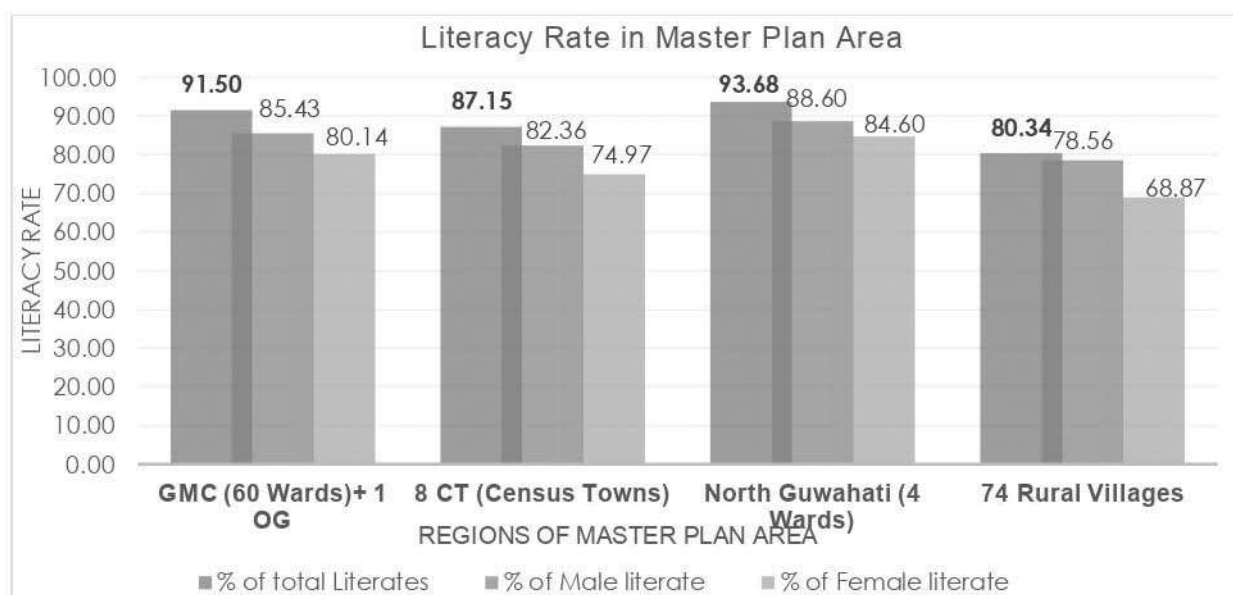


Figure 2-10 Total and male Female Literacy rate of Guwahati Master Plan area

Development is a dynamic process, and it requires educated, skilled, and competent work force. Literacy plays important role in providing skilled work force as well as literate consumer demands more for better lifestyle. Literacy rate refers to the number of literate population to the total.

The literacy rate of the GMPA is 90.55%, which is higher than the state's literacy rate of 72.19%. At the same time, the literacy rate of rural is 80.34% and the urban area has 91.50% literates. Amongst all the districts, Kamrup Metropolitan has the highest literacy rate (89%), while the lowest rate of 59% is recorded in Nalbari. A literacy rate of above 90% is recorded in Guwahati and Dispur circles. Refer Table 2-13 Regional Comparison of Literacy rate

Table 2-13 Regional Literacy rate

Region	Literacy Rate (2011 census)
Assam	72.19%
Kamrup Metropolitan	89%
Guwahati Master Plan Area	90.55%

2.1.7 Working and Non-working population

Table 2-14 Working and Non-working population in Master plan area

Sl. No.	Name of Area	Population	Workers	Non-Workers	% of Worker in total population	% of Non-Worker in total population
1	GMC (60 Wards) + 1 OG	962334	376042	586292	39.08%	60.92%
2	8 CT (Census Towns)	59497	23400	36097	39.33%	60.67%
3	North Guwahati (4 Wards)	10,328	3819	6509	36.98%	63.02%
4	79 Rural Villages	109540	43380	66160	39.60%	60.40%
Total		1141699	446641	695058	39.90%	60.10%

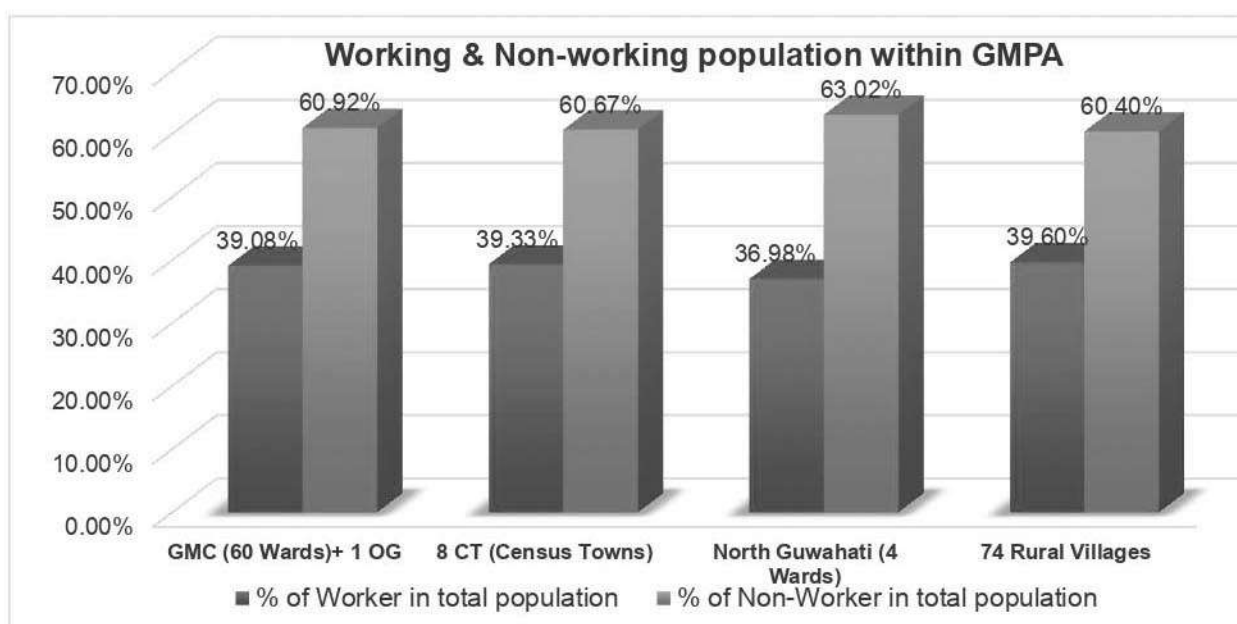


Figure 2-11 Work force participation rate of Master Plan area

2.1.8 SC-ST Population

2.1.8.1 SC/ST Population (GMC Area)

Table 2-15 SC/ST Population ward wise

Ward	Total Population	SC Population	ST Population	%SC	% ST
1	16692	8547	93	5.03	426
2	16613	8780	545	12.04	986
3	11106	5666	127	7.14	407
4	10731	5424	68	11.34	621
5	12526	6357	229	6.23	399
6	10171	5086	129	12.20	616
7	20366	10368	163	8.74	886
8	7593	3856	440	19.54	745
9	6746	3164	412	17.60	596
10	10216	5204	514	4.00	204
11	18514	9508	918	4.76	419
12	39995	20657	4660	8.54	1730
13	29041	14985	3346	6.76	1039
14	17629	9252	336	8.78	839
15	19228	9843	197	4.57	443
16	39056	20100	2485	7.70	1567
17	21292	11083	2588	4.73	531
18	7431	3916	46	3.20	124
19	14957	7825	1	0.91	66
20	11887	6405	58	12.51	795
21	7718	4171	162	11.07	476
22	21169	10629	720	5.20	566
23	10837	5604	1370	4.53	244
24	17830	9071	1512	8.27	729
25	20707	10771	1535	5.03	540
26	10431	5329	219	5.15	295
27	12008	6172	74	1.65	109
28	9828	5270	170	3.97	206
29	6988	3754	2	5.82	215
30	5688	2929	106	2.57	74
31	7387	4100	493	8.23	313
32	10332	5417	90	9.45	514
33	8368	4455	150	4.77	201
34	11088	5497	112	16.28	872

35	11012	5527	201	8.66	478
36	13966	7336	226	5.75	379
37	15854	8224	841	3.66	305
38	8589	4429	250	6.72	303
39	11574	5690	179	2.13	111
40	7782	4023	240	5.55	219
41	21514	11008	591	5.49	591
42	16649	8519	246	3.20	274
43	9295	4757	161	1.20	55
44	15073	7884	996	3.34	269
45	12537	6597	575	9.87	639
46	28309	14923	1962	3.49	527
47	9772	5147	133	4.40	211
48	12686	6565	387	2.82	193
49	30124	15540	1454	4.13	626
50	14084	7446	1232	4.44	340
51	30057	15417	2140	3.90	607
52	9000	4697	375	3.29	163
53	14890	7812	423	3.21	252
54	24226	12572	1571	2.88	357
55	13670	7070	668	4.54	312
56	26625	13797	1111	6.49	913
57	13359	6859	416	5.51	379
58	31876	16838	1392	3.74	642
59	25709	13335	1052	3.57	484
60	26951	14155	384	1.32	197
Total	957352	55721	43276	5.82	4.52

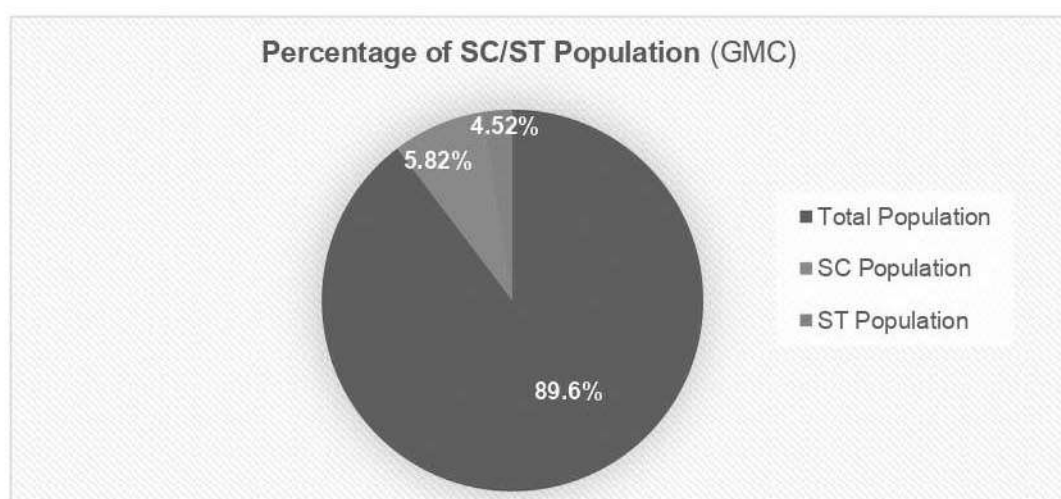


Figure 2-12 Percentage of SC/ST Population in Municipal Area

2.1.8.1 SC/ST Population (GMPA 2011)

Table 2-16: SC/ST Population Details in GMPA

Sl. No.	Name of Area	Population	SC Population	ST Population	% SC	% ST
1	GMC + OG	962334	55896	43391	5.81	4.51
2	8 CT (Census Towns)	59497	7345	1231	12.35	2.07
3	North Guwahati (4 Wards)	10328	4447	97	43.06	0.94
4	79 Rural Villages	109540	10928	13061	9.64	11.52
Total		1141699	78616	57780	6.86	5.04

It can be inferred from the analysis above that Schedule Cast population share is comparatively higher in North Guwahati Than Rural and Urban areas of Guwahati master plan area. However, Schedule Tribe population share is observed little high in rural areas of Master plan constituency. Overall, population share of SC and ST is on lower side compared to rest population in entire Master plan Area.

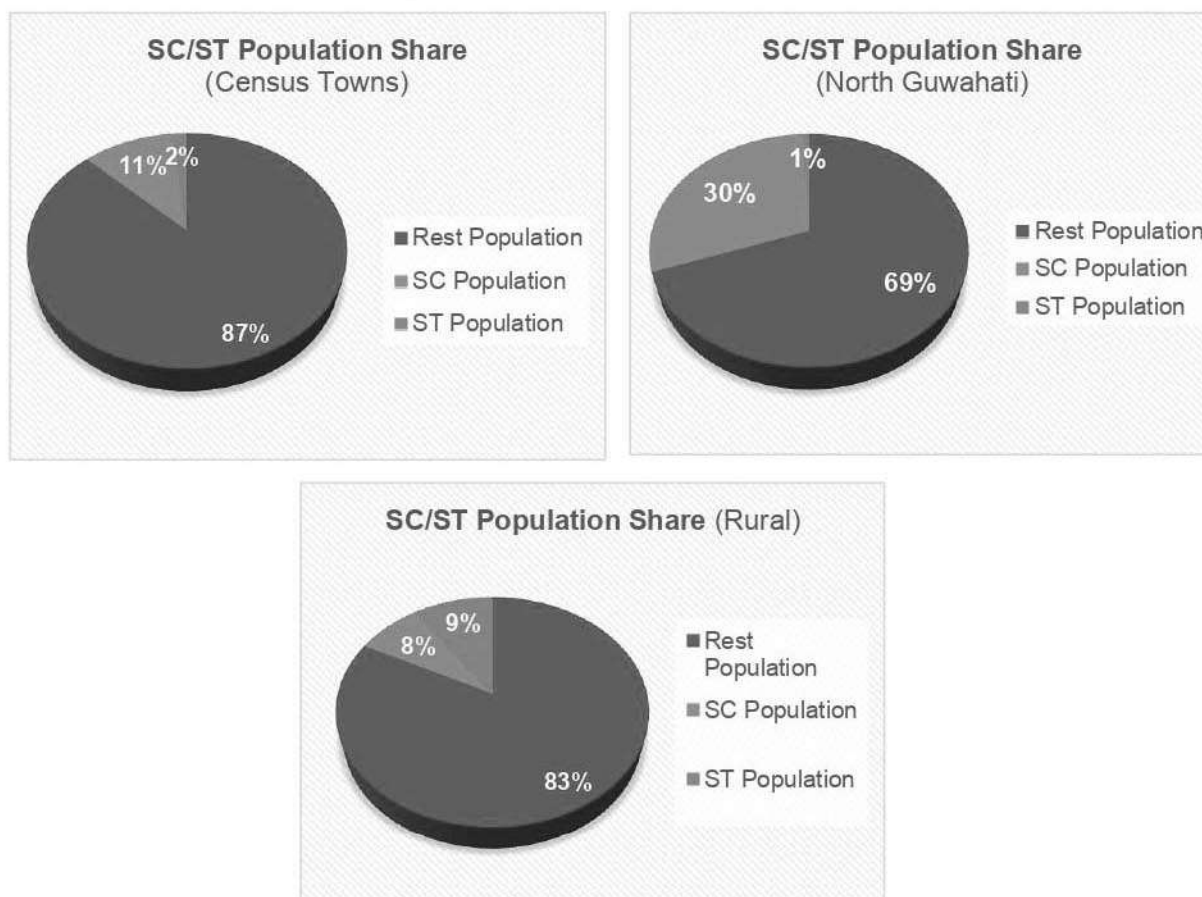


Figure 2-13: SC/ST Population in CTs, North Guwahati and Rural Areas in GMPA

2.2 Migration Population

Migration into Assam is not a recent phenomenon; it is an age-old process since the British colonial period. However, it has occurred on a relatively larger scale in more recent decades particularly after 1971. Although migrants coming to Assam include people from the rest of India as well as from the neighbouring countries of Bangladesh, Nepal and Pakistan, it is the second group which has been a focus of attention during last several years. The high population pressure on land drive huge influx of farm labourer from Bangladesh to Assam. The economic potentiality of the region along with reluctant nature of indigenous people and absence of capital and entrepreneurship made such immigration a vital one.

Out of the total population in Assam about 3.91 percent and 2.65 percent are migrants during 1991 and 2001, of which about 1.51 per cent and 0.71 per cent constitute as the international migrants for the respective years particularly from the countries like Bangladesh, Nepal and Pakistan.

In terms of the International migration, Bangladesh contributes the majority of the migrants (84.85% and 86.14%) followed by Nepal (6.61% and 9.39%) and Pakistan (4.45% and 3.72%) respectively during 1991 and 2001. (Source: North East Connectivity Summit 2017)

Table 2-17 International Migration in Assam for 1991-2001

Volume of Migration (International) in Assam, 1991-2001				
Countries	1991		2001	
	No. of Migrants	Percentage of total migrants %	No. of Migrants	Percentage of total migrants %
Bangladesh	2,88,109	84.85	1,64,144	86.14
Nepal	22,433	6.61	17,896	9.39
Pakistan	15,110	4.45	7,097	3.72
Others	13,903	4.09	1,421	0.75
Assam	3,39,555	100	1,90,558	100

(Medical Visa to India from different countries, Source: Medical Value Travel Report, FICCI)

Along with the international migration the migrants from the other states of India also contributes significant volume of population growth in Assam. Out of the total migrants, the interstate migrant into Assam contributes about 2.39 per cent and 1.93 per cent during 1991 and 2001.

The existence of labour market, employment prospects in the destination area attracts the huge influx of migrants from the different districts of India, leading to structural disequilibrium and cultural mess-up in the region. The differential natures of migrant population from the different parts of the country along with the international migrants lead to the modification of the original population structure of the state of Assam. It also leads to the population redistribution among the states of the country, creating tension or pressure on the land of Assam and its indigenous population.

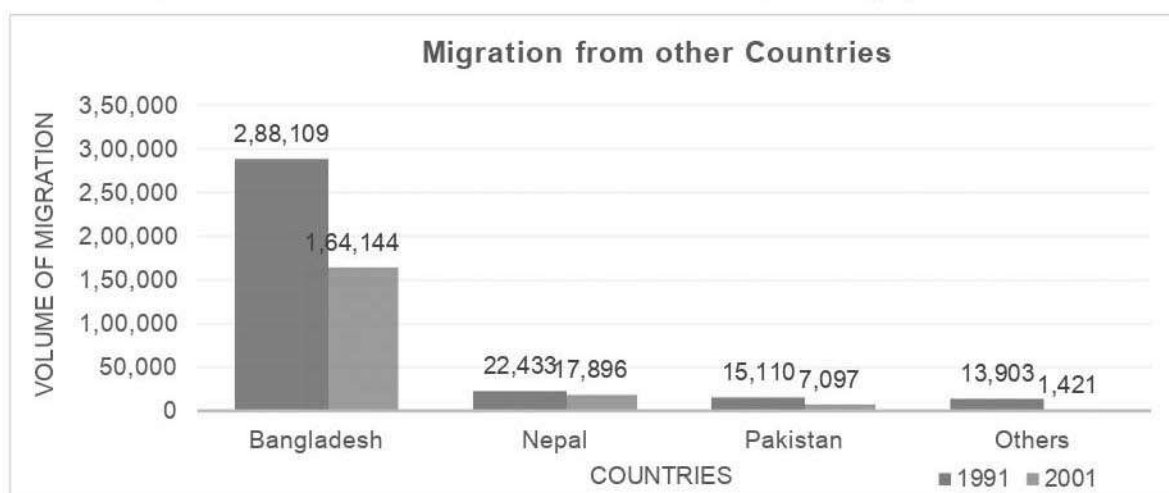


Figure 2-14 International Migration trend

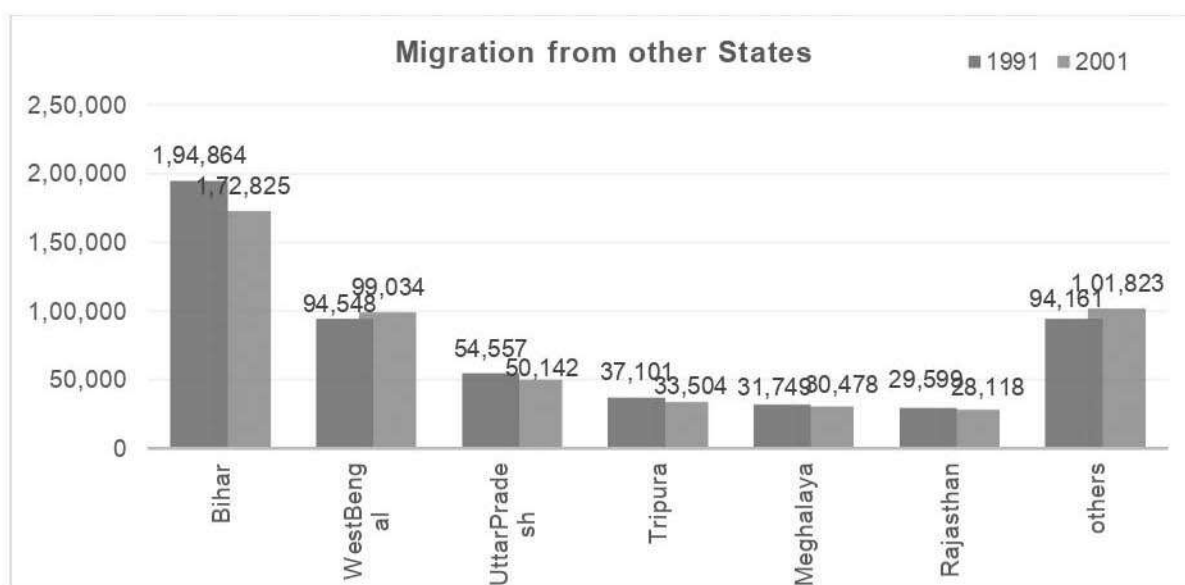


Figure 2-15 Inter State migration trend for year 1991-2001

Table 2-18 Interstate migration trend in Assam, 1991-2001

Volume of Migration (other states of India) in Assam, 1991-2001				
States	1991		2001	
	No. of Migrants	Percentage of total migrants	No. of Migrants	Percentage of total migrants
Bihar	1,94,864	36.31	1,72,825	33.5
West Bengal	94,548	17.62	99,034	19.19
Uttar Pradesh	54,557	10.17	50,142	9.72
Tripura	37,101	6.91	33,504	6.49
Meghalaya	31,749	5.92	30,478	5.91
Rajasthan	29,599	5.52	28,118	5.45
others	94,161	17.55	1,01,823	19.74
Assam	5,36,579	100	5,15,924	100

(Source: India tourist statistic, 2015)

The processes of human movement are always associated with number of reasons including social, cultural, political reasons, employment, business, education, marriage, family movement, etc. People move from one area to another for fulfilment of required and better facilities of amenities. The areas appalling poverty, unemployment, low and uncertain wages, uneconomic land holdings, poor facilities for education, health, recreation etc. move forward the people to migrate to another place where better facility prevails. Thus, it is the push and pull factor acts as ingredients of population migration. Among all the reasons of migration, marriage (36.48 per cent) is considered as the single largest reason for migration. This reason of migration is more pronounced among the females (58.79 per cent) than the male (1.59 per cent) counterparts as female are forced to migrate under the social custom of marriage system. While after marriage, family movement (15.08 %) is also another prominent reason for migration followed by employment, (5.55 per cent) trade and commerce (2.83%), movement after birth (1.03 %) and education (0.69 %).

Most of the family movement form of migration is governed by religious and political reasons of migration process. The shortage of labour force in the primary and secondary sector of economic activity generates the employment opportunity which attracts the large volume of migrants into Assam both in the form of interstate and international migrants. Similarly, the lack of skill of trade and commerce among the people of Assam attracts the large volume of traders to the region.

2.2.1 Migration to GMDA

The discussions under this section are based on the Census 2011 figures. The change in pattern of migration in Guwahati city between 1971, 1991 and 2011 by place of last residence is presented in the following table.

Table 2-19 Change in pattern of Migration in Guwahati city

		District		GMDA
Proportion of Migrants		1971	1991	2011
Persons (Lacs)		58.79	47.38	10.37
Males (Lacs)		63.46	48.19	5.36
Females (Lacs)		51.86	46.34	5.00
Total Migrants (%)		100.00	100.00	100.00
A	Resident in India	83.12	95.4	99.44
A.1	Intra-state	49.42	66.3	89.32
	A.1.1 Within district	25.92	14.6	14.80
	A.1.2 Between districts	23.5	51.7	33.15
A.2	Inter-state	33.71	29.1	10.18
	A.2.1 From Bihar	11.97		3.51
	A.2.2 UP	3.48		0.62
	A.2.3 Rajasthan	2.33		1.01
	A.2.4 West Bengal	6.83		1.92
B	Outside India	16.88	4.6	0.55

(Source: Census of India, 2011)

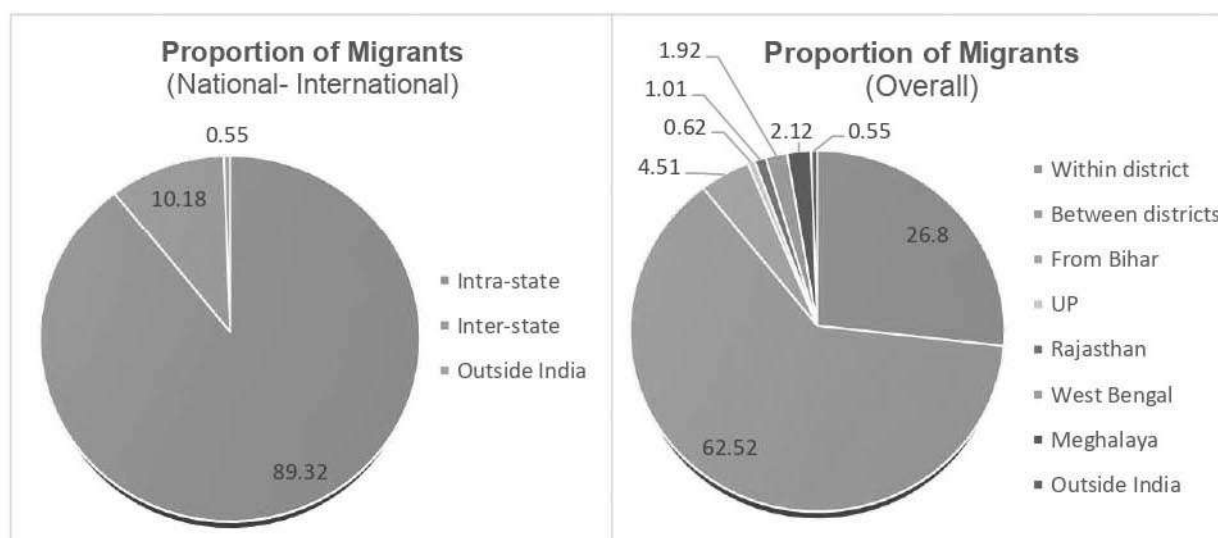


Figure 2-17: Proportion of Migrants in GMDA (National - Inter National)

Figure 2-16: Proportion of Migrants in GMDA (Overall)

It can be inferred from above analysis that the majority migration happens within the State of enumeration only, however 10% migration observed from outer State but

within India only. If we see the outer state migration, Bihar is the state contributes more to migration to GMDA compared to observed other states like Uttar Pradesh, Rajasthan, West Bengal and Meghalaya.

Table 2-20 provides the distribution of migrants by place of last residence in Guwahati city by reasons for migration as per Census 2011 figures.

Table 2-20: Migrants by place of last residence to GMDA by reasons for migration

		Total (%)	Employment (%)	Business (%)	Education (%)	Family movement (%)	Marriage (%)	After Birth (%)	Others (%)
Total		100.0	19.20	6.25	2.40	18.07	23.03	2.58	28.48
A	Last Residence in India								
	Total	100.0	19.23	6.24	2.41	18.00	23.05	2.58	28.49
	Rural	100.0	27.03	8.04	2.36	17.34	30.08	1.63	13.53
	Urban	100.0	14.20	5.35	2.86	21.02	18.67	3.95	33.94
1	Migrants from within Assam								
	Total	100.0	18.70	5.37	2.47	17.24	23.16	2.61	30.45
	Rural	100.0	27.20	6.99	2.52	16.87	31.33	1.58	13.52
	Urban	100.0	13.22	4.66	2.87	20.10	17.99	4.15	37.00
1a	Migrants from within District								
	Total	100.0	9.61	3.91	1.73	17.18	15.19	4.21	48.18
	Rural	100.0	20.56	6.86	1.69	16.45	32.55	3.45	18.43
	Urban	100.0	8.08	3.78	2.11	20.20	12.43	5.28	48.12
1b	Migration from other districts in Assam								
	Total	100.0	25.27	6.42	3.00	17.30	28.91	1.45	17.64
	Rural	100.0	28.76	7.02	2.71	16.96	31.04	1.13	12.36
	Urban	100.0	21.81	6.15	4.16	19.91	27.31	2.27	18.39
2	Migrants from other states in India								
	Total	100.0	22.51	11.60	2.02	22.71	22.42	2.38	16.36
	Rural	100.0	26.02	14.12	1.41	20.06	22.82	1.97	13.59
	Urban	100.0	20.03	9.36	2.78	26.46	22.69	2.79	15.89
B	Last residence outside India								
	Total	100.0	16.33	7.17	1.30	24.45	20.97	2.51	27.27

Source: Adopted from Table D-03, Census of India -2011, Series-4, Migration Tables

The table analysis of migration describes that the majority of it happens within the State of enumeration due to employment purpose and family movement due to work purpose only, however similar percent of migration observed from outer district but within Assam only due to marriage purpose. Very less percentage of migration observed in the reason behind education purpose.

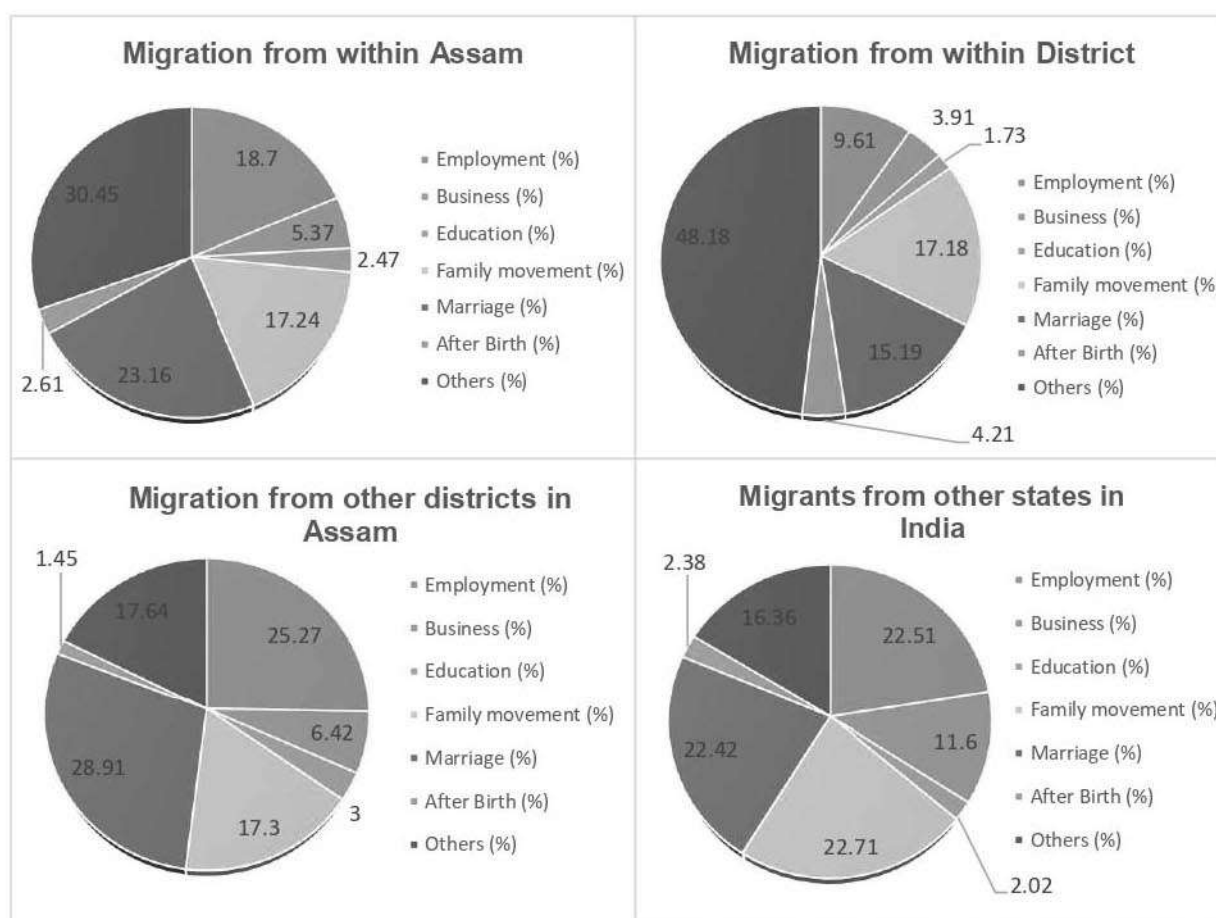


Figure 2-18: Migrants by place of last residence to GMDA by reasons for migration

The relationship within a group of migrants is analysed using contingency and conditional probabilities. The gender-based distribution of migrants within the group is very similar and equals to 20% females.

In major cases most of the migrants availed employment. This indicates the good scope of employment in the city being a gateway to the northeast and various policies to the rural poor. However, education gets discontinued in the upper sections where poverty stands as an obstacle to the continuation of education.

The migrants are influenced by similar socio-economic factors (be it Intra-State migration or Inter-State migration). The pull and the push factors that determine the volume of migration are almost same all over the country. Most of the migrants enumerated for the study have moved out in search of employment opportunities and Business in the city, Associational migration of the dependents like families of the main migrants also took place. The living conditions of the migrants are identical. Although most of the migrants engaged in petty works in the informal sector are capable of supporting their livelihood due to diverged work generated in the urban informal sector

which is absent in the rural areas, yet, an improvement in their standard of living is doubtful.

Migration has been a very contentious issue in the state of Assam and Guwahati city in particular. This has led to manifold increase in the issues of migration like; creation of slum pockets, increasing density of population, a formidable growth of the informal sector, poor living conditions etc. Therefore, care should be taken to control this unstoppable gush of migrants to the city. Policies should be framed in favour of the rural areas so that the people do not feel a need to move out to a new place. Employment opportunities should be created in the villages

2.3 Household Density

Table 2-21 Household Density

Sl.No	Name of Area	Area (ha)	No. of Household (HH)	Household Density (HH/ha)
1	GMC (60 Wards) + 1 OG	17617	230769	13
2	8 CT (Census Towns)	3316	13622	4
3	North Guwahati (4 wards)	389	2294	6
4	79 Rural Villages	11478	24540	2
	Total	32800	277525	8

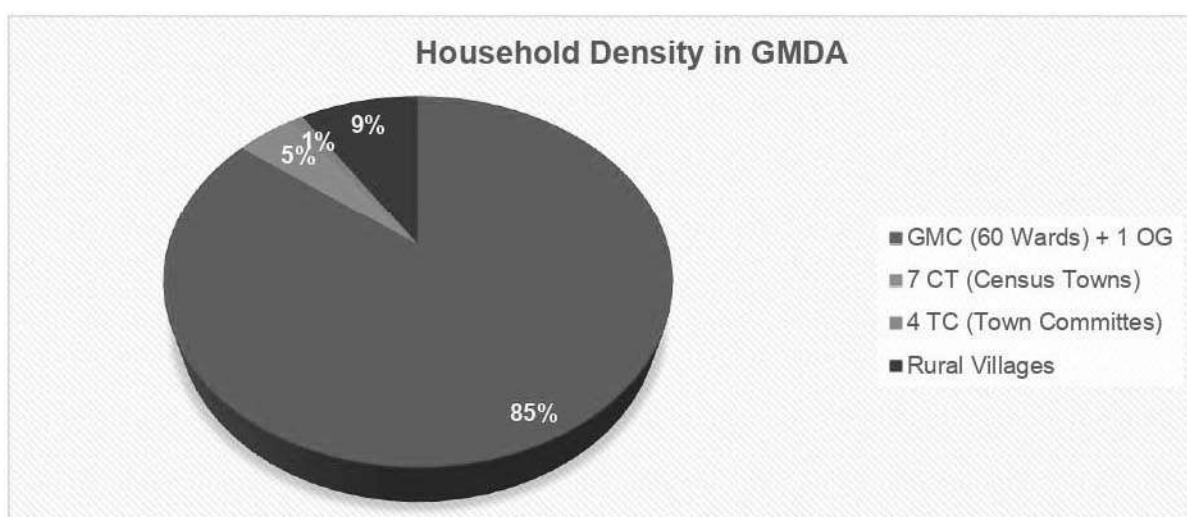


Figure 2-19 Household density of Guwahati Master Plan Area 2011

The above analysis reveals that the number of housings per hectare are more in the GMC area compared to rest of the settlements in region. Moreover, it can also be inferred from the analysis that the per capita open field availability is less in GMC area compare to other settlement around the city.

2.4 Population Projection

Population projection is a forecasting tool that helps to estimate the changes in population size and demographic structure. It is mandatory for Government policy makers and planners to determine the future demand for basic human needs such as food, water, education, health, energy and other services and to forecast future demographic characteristics. The main objective is to provide or undertake activities aimed at achieving population stabilization, sustainable and environmental protection by the year 2045.

Population projection is a scientific/mathematical attempt to peep into the future population scenario, conditioned by making certain assumptions using data to the past available at the point of time. Assumptions used and their probability of adhering in future forms a critical input in this mathematical effort. Predicting the future course of human fertility and mortality is not easy, especially when looking beyond much further in time. Medical and health intervention strategies, food product and its equitable availability, climatic variability, socio-cultural setting, economic condition and a host of other factors influence population dynamics, making it a somewhat unpredictable exercise. Therefore, much caution must be exercised when either making or using the population projection and the context of various conditions imposed, should not be lost sight of on the basis of past behaviour and the likely future scenario assumed.

In Guwahati Planning area different mathematical methods are used for the estimation of projected population for the horizon year are Arithmetic Progression Method, Geometric Progression Method, Incremental Increase Method and Average Arithmetic Incremental Increase method.

2.4.1 Arithmetic Progression Method

This method is suitable for large and old city with considerable development. If it is used for small, average or comparatively new cities, it will give lower population estimate than actual value. In this method, the average increase in population per decade is calculated from the past census reports. This increase is added to the present population to find out the population of the next decade. Thus, it is assumed that the population is increasing at constant rate.

- Hence, $\frac{dP}{dt} = C$ i.e., rate of change of population with respect to time is constant.
- Therefore, Population after n th decade will be **$P_n = P + n.C$ (1)**
- Where, P_n is the population after ' n ' decades and ' P ' is present population.

Table 2-22 Population projection for 2045 based on Arithmetic Progression Method

Method	1991	2001	2011	2021	2031	2041	2045
Arithmetic Progression Method	707955	990161	1141699	1358571	1575443	1792315	1879064

(Source: Consultant Compilation)

2.4.2 Incremental Increase Method

This method is modification of arithmetical increase method and it is suitable for an average size town under normal condition where the growth rate is found to be in increasing order. While adopting this method the increase in increment is considered for calculating future population. The incremental increase is determined for each decade from the past population and the average value is added to the present population along with the average rate of increase.

- Hence, population after nth decade is $P_n = P + n.X + \{n(n+1)/2\}.Y$ (3)
- Where, P_n = Population after nth decade
- X = Average increase
- Y = Incremental increase

Table 2-23 Population projection for 2045 based on Incremental Increase Method

Method	1991	2001	2011	2021	2031	2041	2045
Incremental Increase Method	707955	990161	1141699	1489239	1836779	2184319	2323335

(Source: Consultant Compilation)

2.4.3 Geometric Progression Method

In this method, the percentage increase in population from decade to decade is assumed to remain constant. Geometric mean increase is used to find out the future increment in population. Since this method gives higher values and hence should be applied for a new industrial town at the beginning of development for only few decades. The population at the end of nth decade ' P_n ' can be estimated as:

- $P_n = P (1 + IG/100)^n$ (2)
- Where, IG = geometric mean (%)
- P = Present population
- n = no. of decades.

Table 2-24 Population projection for 2045 based on Geometric Progression method

Method	1991	2001	2011	2021	2031	2041	2045
Geometric Progression Method	707955	990161	1141699	1420875	1768316	2200716	2420788

(Source: Consultant Compilation)

2.4.4 Logistic Curve Method

This method is used when the growth rate of population due to births, deaths and migrations takes place under normal situation and it is not subjected to any extraordinary changes like epidemic, war, earthquake or any natural disaster etc. the population follow the growth curve characteristics of living things within limited space and economic opportunity. If the population of a city is plotted with respect to time, the curve so obtained under normal condition is look like S-shaped curve and is known as logistic curve.

$$\log_e \left(\frac{P_s - P}{P} \right) - \log_e \left(\frac{P_s - P_0}{P_0} \right) = -K.P_s.t$$

Where,

- P = Population at any time t from the origin J
- P_s = Saturation population
- P_0 = Population of the city at the start point J
- K = Constant
- t = Years

Table 2-25 Population projection for 2045 based on Logistic Curve method

Method	1991	2001	2011	2021	2031	2041	2045
Logistic Curve Method	707955	990161	1141699	1530428	2280815	4102185	5306837

2.5 Population Projection for 2045

Population projection has been done using all above Four methods. It is important to note that none of the above-mentioned methods is empirical, and they are based on probability. Out of them, Average of Geometric and Logistic Curve Method has been found suitable for Guwahati Master Planning Area 2045 considering the daily floating population, migration factor and forecasted scope of economic development in the region. The population figures of year 1991, 2001 and 2011 are from the Census of India and 2021, 2031, 2041 & 2045 figures are estimated as below.

Table 2-26 Population Projection 2045

Year	1991	2001	2011	2021	2031	2041	2045
Population	707955	990161	1141699	1475651	2024565	3151450	3863812

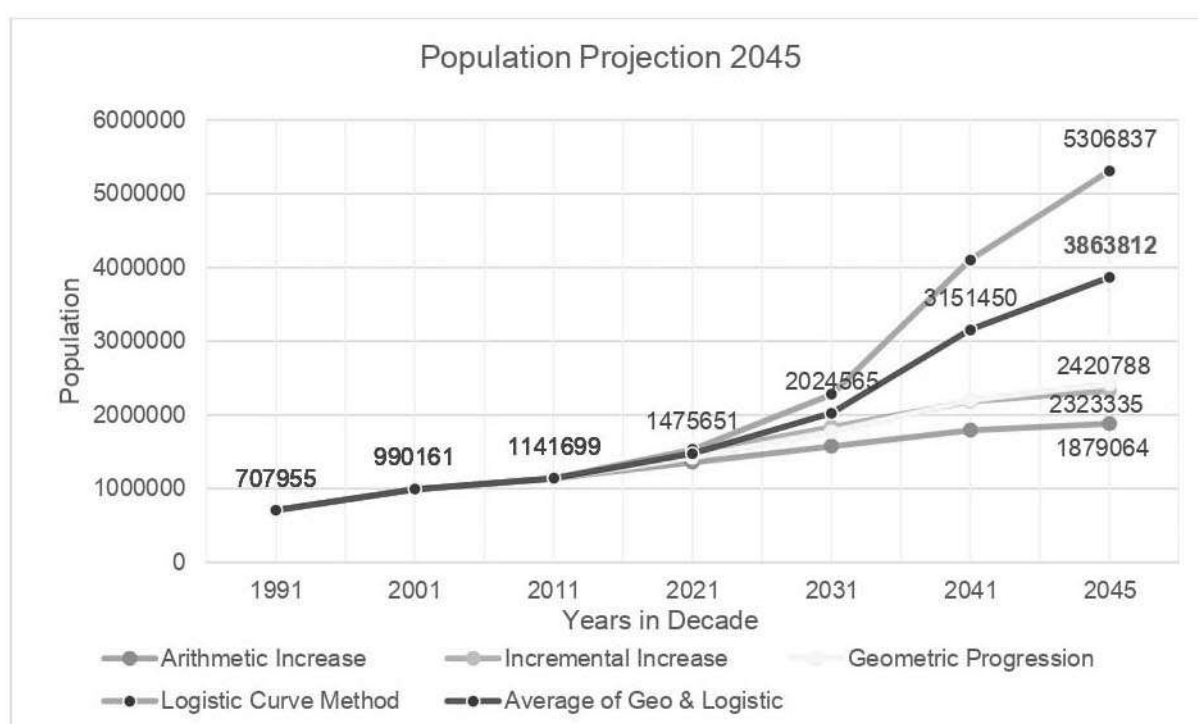


Figure 2-20 Population Projection for 2045

(Source: Consultant Compilation)

2.5.1 GMC and GMDA Projected Pop. Growth Rates

The growth rate numbers emerged out during calculation of Population projection by Average of Geometric and Logistic Curve Method are as mentioned Below

Table 2-27 Population Projection based on Logistic Curve Method

Year	GMC Population	Rural Population	GMDA Population	GMC Growth Rate (%)	GMDA Growth Rate (%)	GMC share of Total (%)
1991	584342	123613	707955	-	-	82.54
2001	818809	171352	990161	40.12	39.86	82.69
2011	962334	179365	1141699	17.53	15.30	84.29
2021	1282046	193605	1475651	33.22	29.25	86.88
2031	1778783	245782	2024565	38.75	37.20	87.86
2041	2776743	374707	3151450	56.10	55.66	88.11
2045	3379290	484522	3863812	21.70	22.60	87.46

(Source: Consultant Compilation)

3. ECONOMIC BASE AND EMPLOYMENT

Economy can be defined as the interrelated activities that deal with consumption and production. Different activities that provide employment opportunities and income constitute the economic base of an area. Local economy depends of the economic base of an area. The economic sector needs to be tapped well and contribute for the growth of the planning area and region. Therefore, the region requires strong economic magnets for future economic development of the Region.

Guwahati, located on the bank of the Brahmaputra River, is a prime commercial hub of the state. Acting as a gateway to Northeast, Guwahati plays a pivotal role in the supply of essential commodities to the neighbouring states, and its own major districts. Several organizations like IIT, Guwahati university, Guwahati Medical College, Cotton University, Oil India Refinery, Guwahati Tea Auction Centre, NEFR has helped the city grow in importance.

Over the past few years, people from other states and places are coming and settling down in Guwahati due to the town's increasing prospects and developments in the field of education, medical facilities, real estate business, and other commercial enterprises. The economy of this town is mainly driven by small and medium scale industries which include a sawmill, timber works, engineering works, ice factory, metal, Hume pipe, cane, steel, plastic industries, etc. Guwahati is also a trade and processing center for tea, rice, and some other agricultural

The service sector provides employment in both the formal sector and the informal sector. Most of the workforce in the formal service sector is likely to be engaged in administration and other institutional areas of employment since Guwahati is the capital of Assam and also a hub of educational institutions. The workforce in the informal service sector, comprising of the urban poor and lower-income groups, are likely to be petty shopkeepers and vegetable sellers, small shop assistants, mechanics, cleaners, domestic help, cooks and waiters in food joints, construction workers, cycle rickshaw drivers, and manual labourers working in the wholesale and retail markets. Recently, the town is getting overcrowded due to the booming real estate market and other commercial enterprises. On the other hand, manufacturing, agriculture, forestry is forming the important economic sectors of Guwahati.

3.1 Urban Economy and Poverty

3.1.1 State Economy

Before analysing the economy of Guwahati, we look at that of urban Assam in comparison to urban India to assess how different is the state from overall India. Overall, urban Assam has lower Work Participation Rate (WPR) than that of urban India. In 2011-12, urban Assam's WPR was just 32.9 per cent, which was lower than that of India's 35.5 per cent. This was on account of very low female WPR, at 9.0 per cent in urban Assam as compared to 14.7 per cent in urban India. Male WPR is nearly the same in both urban Assam and urban India. Women are thus not finding work in urban Assam. This was the case even in 2004-05, when urban Assam's female WPR was 10.9 per cent while that in urban India was 16.6 per cent. Even urban Assam has experienced decline in the female WPR in the last decade like in urban India.

Table 3-1: Employment Details, Work Participation Rate of Urban Assam and India.

Economic Profile	Urban Assam		Urban India	
	2004 - 2005	2011 - 2012	2004 - 2005	2011 - 2012
work participation rate - male (%)	55.1	54.2	54.9	54.6
work participation rate - female (%)	10.9	9	16.6	14.7
work participation rate - person (%)	33.6	32.9	36.5	35.5
Self-employment - male (%)	45.3	55	44.8	41.7
Regular employment - Male (%)	45.3	35.2	40.6	43.4
Casual Labour - Male (%)	11.4	9.8	14.6	14.9
Self-employment - female (%)	26.4	46.7	47.7	42.8
Regular employment - Female (%)	54.5	44.4	35.6	42.8
Casual Labour - Female (%)	19.1	7.8	16.7	14.3
Primary sector employment - Male (%)	4.3	4	6.1	5.6
Secondary sector employment - Male (%)	21.4	23.2	34.4	35.3
Tertiary sector employment - Male (%)	74.3	72.9	59.5	59.1
Primary sector employment - Female (%)	7.3	7.4	18.1	10.9
Secondary sector employment - Female (%)	8.7	12.6	32.4	34
Tertiary sector employment - Female (%)	84	80	49.5	55.1

[Source: NSSO (2006, 2014)]

Urban Assam's economy is dominated by tertiary sector. In 2011-12, 72.9 per cent male and 80 per cent female workers were employed in this sector as compared to 59.1 per cent and 55.1 per cent, respectively, in urban India (Table 3-1). Urban Assam offers low employment in agriculture, indicated by just 4.0 per cent male and 7.4 per cent female workers employed in this sector in 2011-12 when these figures for urban India are 5.6 per cent and 10.9 per cent, respectively. Assam has not attracted industries and hence has very low employment in the secondary sector; 23.2 per cent

male and 12.6 per cent female workers were employed in this sector in 2011-12. In urban India, 35.3 per cent male and 34.0 per cent female workers were employed in the secondary sector in the same year.

Secondary sector consists of manufacturing and construction. 9.0 per cent among male workers and 0.9 per cent among female workers in urban Assam were employed in construction while in urban India these figures were 10.7 per cent and 4.0 per cent respectively in 2011-12. This means that urban Assam is not lagging behind India too much in construction sector employment. This means that manufacturing sector has not developed in urban Assam, keeping employment in this sector, and hence in the overall secondary sector, low in urban Assam. Like in India, there was improvement from 2004-05 to 2011-12 in secondary sector employment in urban Assam, by about two percentage points in case of male workers and four percentage points in case of female. Due to absence of manufacturing sector employment and non-possibility of continuing in agriculture sector, an overwhelming proportion of workers, both male and female, in urban Assam are concentrated in tertiary sector. There was only about 1.5 percentage point decline in male workers' employment in tertiary sector and four percentage point decline in female workers' employment in tertiary sector.

The tertiary sector employment is in both self-employment as well as regular employment type of work. 55.0 per cent male workers were self-employed and 35.2 per cent of them were regular employed in urban Assam in 2011-12. In urban India, 41.7 per cent and 43.4 per cent male workers were in self and regular employment, respectively (Table 3-1) Since agriculture employment is not large among urban males, it is evident that the self-employment is in tertiary sector in urban Assam. Since manufacturing employment is not large among urban males, regular employment is also mainly in tertiary sector in urban Assam.

Regular employment among the female workers was 44.4 per cent in urban Assam in 2011-12, which is higher proportion than among males (35.2%) (Table 3-1). All this employment is likely to be in the tertiary sector where 80 percent of the women workers are in urban Assam. Proportion of self-employed female workers is 46.7 per cent, which is lower than the proportion among the male workers (55.0%). It is likely that many women are in the low-end services such as domestic work, etc. which fetches regular work.

There is much lower casual work availability in urban Assam, among male and female workers both, as compared to urban India. This must be on account of low manufacturing sector work. There is a very high decline in casual workers among the females in urban Assam from 2004-05 to 2011-12 (from 19.1% to 7.8%). Among the male workers also casual work has declined in urban Assam, while that in urban India the same has increased among male workers during the same period. A dramatic change is near doubling of self-employment among female workers and a 10-percentage point increase in the share of self-employment among male workers in urban Assam, most of which will be in the tertiary sector indicating a situation of under-employment. That explains why rental housing an important economic activity in cities is such as Guwahati and for which access to land is essential, explaining desire to own land in cities such as Guwahati (as we would discuss later in the paper). In contrast, in urban India, self-employment has declined among male as well as female workers in 2004-05 to 2011-12 period.

Urban Assam's poverty line in 2011-12 was Rs. 1,008 per capita per month, which comes to Rs. 33 per capita per day (Planning Commission 2013: 5). Using Tendulkar Committee methodology (Planning Commission 2009), urban poverty has been estimated to be 20.49 per cent in 2011-12 (Planning Commission 2013: 6), which means 9.21 lakh people were below the poverty line of Rs. 1,008 per capita per month. Incidence of urban poverty is higher in Assam than India (13.70 per cent) in 2011-12. This is also reflected in low monthly per capita expenditures in urban Assam (Rs. 2,090.18), which is 84 per cent as that of urban India (Rs. 2,477.02). However, urban poverty incidence (of 20.49 per cent) is far lower than the rural poverty incidence (33.89 per cent) in Assam (Planning Commission 2013: 6). Both, rural and urban poverty incidence in Assam were higher than that in India in 2011-12; rural and urban poverty incidence in India being 25.70 per cent and 13.70 per cent, respectively (Planning Commission 2013: 6).

In 2004-05, as per the Tendulkar Committee methodology, poverty incidence in urban Assam was 21.8 per cent as compared to 36.4 per cent in rural Assam (Planning Commission 2009: 17). Thus, 8.46 lakh people were below the poverty line in urban Assam. In India, urban and rural poverty incidence was 25.7 per cent and 41.8 per cent respectively (Planning Commission 2009:17), indicating that poverty incidence in

Assam, both rural and urban was far lower than in India. But, since then, while poverty has declined rapidly in India while Assam has lagged behind.

There is a decline of 1.3 percentage points (from 21.8 % to 20.5%) in urban poverty in Assam whereas that in urban India has been 12 percentage points (from 25.7% to 13.7%). But, on the whole, there is increase in number of urban poor, from 8.46 lakhs in 2004-05 to 9.21 lakh in 2011-12, which is an increase at the rate of 1.2 per cent p.a. in this seven-year period. The poverty trends in urban Assam match with the employment trends wherein we do not see any improvement, and on the contrary see increase in self-employment.

By a different methodology adopted by the Planning Commission (Press Information Bureau 2007), poverty estimate for the Kamrup district was the very low level of 2.94 per cent. This is probably due to the concentration of slums only in the city area while the urban agglomeration and the district itself is quite prosperous (Srivastava et.al. 2010). The City Development Plan 2006 estimated that the municipal area had 31 per cent population below poverty line in 2001 (GMC 2006), an estimate which is likely to be based on the Below Poverty Line (BPL) survey conducted in the city and hence is very different than the poverty estimate obtained from the NSS's consumption expenditure survey.

3.1.2 City Economy

Guwahati is the major hub of economic activity in the entire North-East region. The establishment of Guwahati refinery in 1962 marked the beginning of industrialisation in the city. The construction of the bridge over Brahmaputra at Saraighat and the shifting of the capital from Shillong to Guwahati in 1972 (as Shillong was made capital of the newly formed Meghalaya state carved out of Assam) made it into one of the most important cities in the North-East.

Guwahati is a major port on the banks of Brahmaputra, the capital of Assam and the urban hub of the Northeast. Primary industries include petrochemicals, tea-Assam is one of the world's prime producing region - tourism and regional logistics. Apart from that, people are dependent on fishing and agricultural sectors for economy generation. According to the census of 2011, the total working population of the Guwahati Planning Area is around 4.4 lacs, out of which male working population is 3.44 lakhs and 1.03 is female working population. This clearly indicates that 6.9 lakhs are dependent

population in the Guwahati Planning Area. As far as the total working population is concerned, more than two third (78.88 %) of the working population is engaged in tertiary sector, (18.34 %) in primary sector and very meagre i.e., 2.78% are in secondary sector.

The economy of the city is essentially based on the tertiary sector. Majority of the workforce in Guwahati is dependent on the government and public sector jobs indicating lack of development of Industries and enterprise.

Table 3-2 Economic Indicators of city and its comparison (City, State and Nation)

Indicator	City (GMC)	State (Urban)	India (Urban)
Per Capita Income (Rs.) at 2004-05 constant price*	43278	23019	35947
Urban Poverty Ratio (% of urban population) **	9.09	20.6	13.7
Unemployment Rate, 2011-2**	4.32	5.6	3.4
Work Participation Rate, 2011-12***	31.75	32.9	35.5
Work Status, 2011-12 (%) ***			
Self-employed:	47.45	53.8	42
Regular/wage salaried employees:	48.47	36.5	43.4
Casual labour:	4.08	9.6	14.6
Sectoral Distribution of Workers, 2011-12 (%) ***			
Primary	15.96	8.4	7.5
Secondary	18.59	17.8	34.2
Tertiary	65.45	73.8	58.3
Workers Classified by Major Occupation, 2011-12 (%) ***			
Legislators, senior officials, and managers	0.85	4.8	15.8
Professionals	14.63	17.3	8.8
Technicians and associate professionals	4.51	7.5	6.7
Clerks	4.05	4.7	5
Service workers and shop and market sales workers	18.81	24.8	14.7
Skilled agricultural and fishery workers	6.22	4.1	4.6
Craft and related trades workers	28.29	15.8	19.2
Plant and machine operators and assemblers	3.13	5.1	9.2
Elementary occupations	15.37	12.5	16.1
Workers not classified by occupation	4.14	3.4	0.1
Primary Commodity Manufactured#	Bakery products, Cane product, Carbon		
Major Industries##	Tea, Silk and Handloom		

Note: 3 year average of 2009-10, 2010-11 and 2011-12

Source: * Directorate of Economics and Statistics of respective State Governments and for all India- Central Statistics Office, **Unit Level Data of National Sample Survey Organization, Household Consumer Expenditure in India, 68th Round, 2011-12, ***Unit Level Data of National Sample Survey Organization, Employment and Unemployment Situation in India, 68th Round, 2011-12, #District Census Handbook, Census of India, 2011

##District Industrial Profile, Micro, Small and Medium Enterprises, Government of India

3.2 Sectors of Economy

The economy is categorized under the main three sectors as Primary, Secondary and Tertiary. If we talk about Guwahati particularly the Primary sector comprises agriculture, horticulture and forestry, sericulture & fishing, mining and quarrying, animal husbandry and dairy as subsidiary industries. Manufacturing, household Industries and construction industry are considered in Secondary sector where as trade, tourism, hotels & restaurants, transport, storage & communication, banking, public administration, and informal sector are part of Tertiary sector.

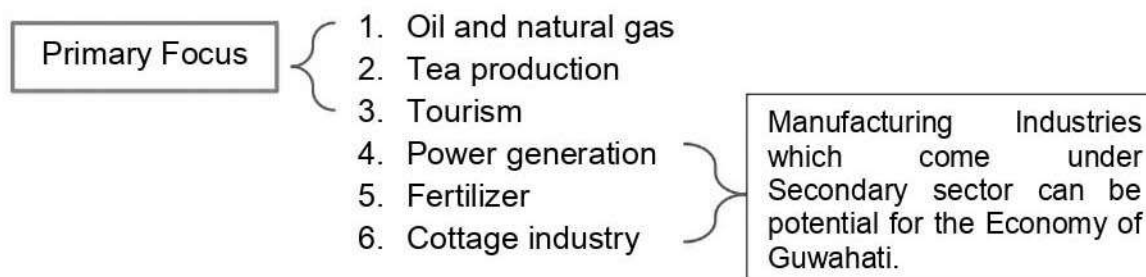
Table 3-3 Sector wise economic distribution

Primary Sector	Agriculture & Horticulture, Sericulture & Fishing, Oil & Gas, Animal Husbandry
Secondary Sector	Manufacturing, Household Industries, Construction.
Tertiary Sector	Trade, Tourism, Hotels & Restaurants, Transport, Storage & Communication, Banking and Informal sector

Guwahati Local Economic Base

Guwahati is the largest metropolis in north-eastern India. A major riverine port city along with hills, and one of the fastest growing cities in India, Guwahati is situated on the south bank of the Brahmaputra. It is called the 'Gateway to Northeast India'.

Guwahati is considered as an economic hub of Northeast region of India, because of the following industries:



Guwahati, in the recent year have seen development of some small-scale industries. Since the time immemorial, many cottage industries have existed among the people of the area. Small Scale industry includes:

- Weaving Industry
- Eri silk Industry
- Cane and Bamboo Industry
- Metal Industry
- Sawmills Industry

3.3 Primary sector

3.3.1 Agriculture, Horticulture & Forestry

Agriculture contributes largely to the economy of District. Due to Urbanization, agricultural production is only restricted to the district and is not found in the city. Majority of the people of the rural population are dependent upon agriculture. The tribal people of the area practice a distinctive feature of agriculture known as the Jhum Cultivation. During the autumn season the cultivation is normally done either as a single crop or as mixed crop along with ginger, Maize, chillies, turmeric and other vegetables. Some horticultural crops cultivation, such as orange, pineapple, banana and papaya occupy an important role in the agricultural economy of the area.

The climate, rainfall, and temperature, as well as soil condition, have a pronounced effect on the growth of natural vegetation of Guwahati. The laterite soil having high acidity does not allow luxuriant vegetation. However, the mixture of 61 humus contents and deposits of muddy clay by the riverbank in the low-lying pockets have increased the fertility of the soil.

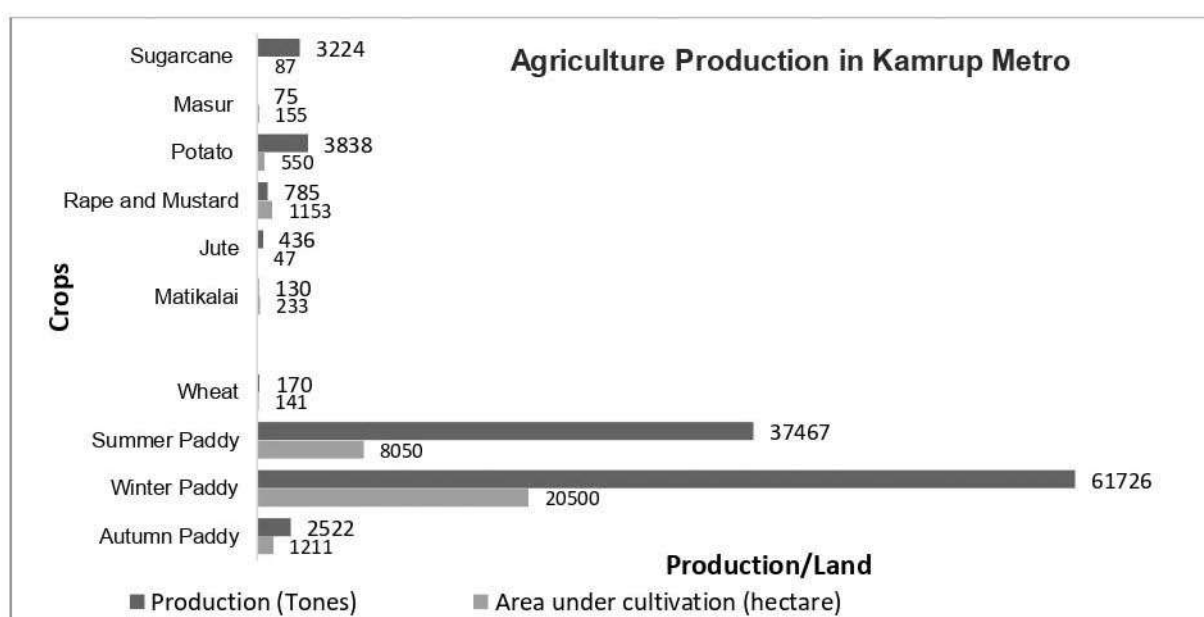


Figure 3-1: Agriculture Production Details in Kamrup (Source: Statistical Handbook of Assam, 2012, Census 2011)

Agriculture is the backbone of its economy providing livelihood to about 78% of the total population. Rice is the staple food of the inhabitants and paddy is the principal crop of the District. The major agriculture production includes crops like wheat, paddy, sugarcane, potato, masur, rape mustard, jute and matikalai. Since, paddy is a staple food of Assam, the production of paddy crop is higher in the district. Highest paddy

production observed the season of winter. Sugarcane and jute harvested in the limited quantity in the district since the crops dependent on industrial consumption.

The vegetation includes coconuts, betel nut, banana plants in abundance. Besides, mango, peepal, neem, simul, Kadam and other shady trees along with bushes and shrubs are also available in the town area. In terms of natural resources endowment, the economy is purely agrarian.

Horticulture Production in Kamrup Dist. (2017-18)

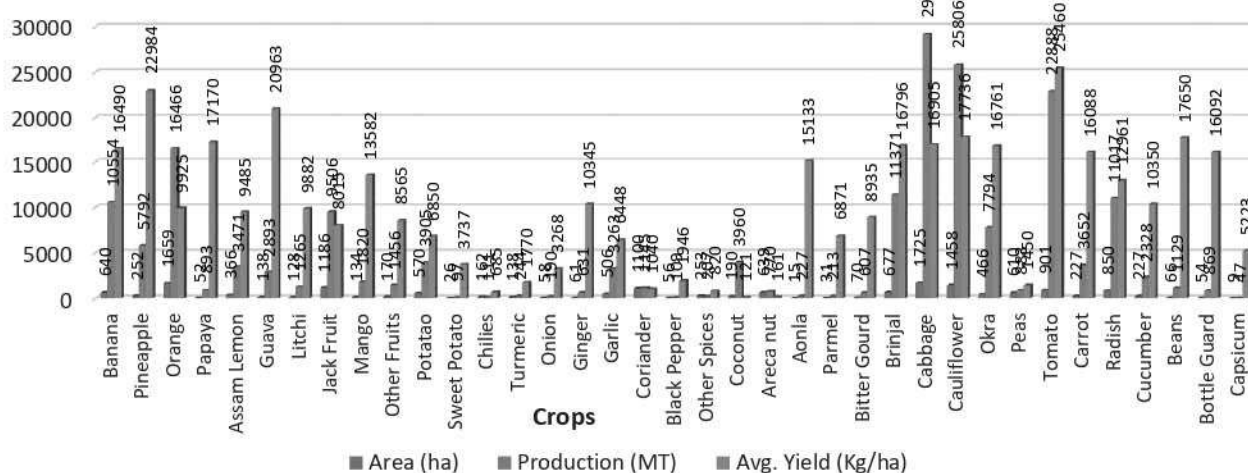


Figure 3-2: Horticulture Production details in Kamrup District (2017-18)

(Source: Director of Horticulture & FP, Assam, 2017-18)

District observes variety of horticulture cropping in the region. Major products in horticulture within district are orange, pineapple, banana, lemon, jack fruit, sweet potato, brinjal, cabbage, cauliflower, okra, tomato, carrot, radish and cucumber.

Cabbage is the highest producing crop among all horticulture products in District. Apart from cabbage, orange, banana, jack fruit, cauliflower, tomato, radish and jack fruit are also major producing horticulture crops in district. The production of banana is common to majority of rural households. All the varieties of banana are grown in plenty and sold to the market at a cheap rate compared to the market prices in the major towns. Banana plant is the one which is used from the roots to the leaves.

The agro climatic conditions of Guwahati are favourable for different agricultural activities such as development of the plantation crops like cashew, coconut, Areca nut and also aromatic plant like patchouli. Forestry plays a significant role in the economy as a considerable section of the people depends for firewood and rubber, timber, bamboo, ekra reed, thatch, tokopat, cane etc. for building their dwelling houses. A number of forest base industries like saw-mills, furniture workshops, bamboo and cane

industry etc. have also been set up. Besides, boulders, gravels, sands and other forest products also earn considerable revenue to the Government.

3.3.2 Sericulture and Fishing

Sericulture is an old age cottage industry of the rural people. It is done during the agricultural off season as a subsidiary occupation. The popular and durable Endi and Muga are the products of this industry. After independence, the Department of Sericulture and weaving and The Central Silk Board of India came into operation and provided a fresh face-lift to this industry.

Sericulture plays a pivotal role in the rural economy. The art of sericulture and rearing of cocoons for the manufacturing of various silk cloths were unknown to the Assamese since early time. The State government and the Central silk Board have taken various measures for the development of sericulture in Assam to increase the production of seed cocoons as well as the quality of yarn. Assam is famous for her mulberry and other kinds of silks known as Pat, Eri, and Muga. Muga is non-mulberry silk. The Government is trying to provide a wider employment opportunity to the weavers under various schemes undertaken through its concerned department.

Assam enjoys global monopoly in terms of Muga or golden silk production. The state accounts for around 95% of global Muga production. Moreover, Assam is the country's major Eri silk producer (accounts for 65% of the country's Eri silk production). Raw silk production in the state during 2015-16 was recorded to be 3,325 MT whereas during 2016-17 (up to May 2016), raw silk production in the state stood at 1,137 MT. Seneh Jori, an Assam Silk Outreach Mission, aims to produce 1 million kg of Muga silk and 10 million kg of Eri Silk by 2025.

Table 3-4: Details of Sericulture Practices in State and Kamrup district

Name of Region	Total area under Silkworm food plants (in hect.)			Yield of Cocoons (in MT)			Production of Silk Yarn (in hect.)		
	Eri	Muga	Mulberry	Eri	Muga	Mulberry	Eri	Muga	Mulberry
2017-2018									
Assam	29596	10622	1545	5919	6050	405	3549	121	42.5
Kamrup & Kamrup (Metro)	944	249	46	188	653	5.11	145	13	0.5

(Source: Directorate of Sericulture, Assam, 2017-18)

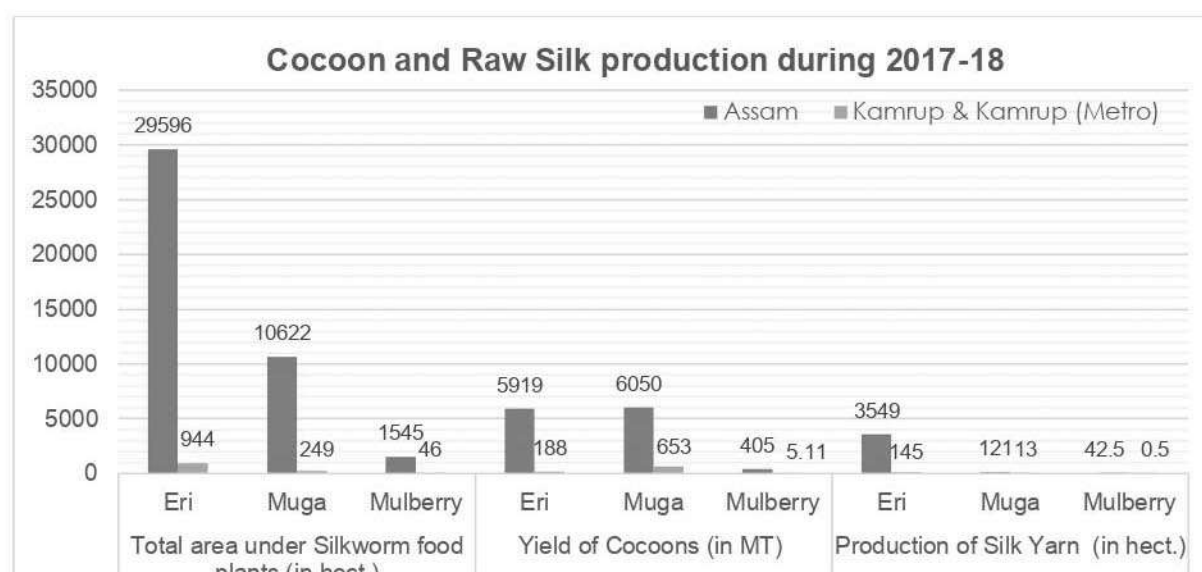


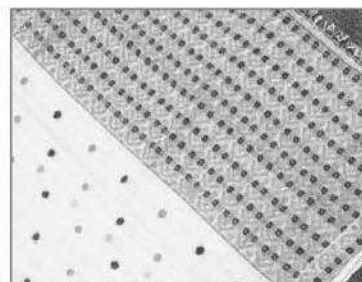
Figure 3-3: Annual Cocoon and Raw Silk Production in Kamrup (2017-18)



Eri Silk - is of coarser in quality and used by common people.



Muga Silk – stouter and durable than other



Mulberry Silk –highest quality of silk, long fiber and odorless

3.3.2.1 Central schemes for the development of silk production

Integrated sericulture development project (ISDP) is under implementing stage where the districts like Kamrup, Cachar, Golaghat and Lakhimpur where above 2840 are benefiting by Muga type of silk. Silk samagra project was submitted to ministry of textiles for approval where districts like Kamrup and Karimganj where above 650 families are going to be benefited by Eri type of silk.

Fish is abundantly available in all the districts of Assam, as it is a land of rivers, bils, swamps, ponds etc. The most popular among the large variety of fishes are Rahu, Bahu, Mirika, Pithila, Kurhi, Bhangon, Barali etc. The smaller variety of fishes Kaoli, Magur, Singee, Pabha, Eleng, Bariala are common. The development of fisheries in the district is undertaken by the Government.

The Dipor Beel is reported to provide, directly or indirectly, its natural resources for the livelihood of fourteen indigenous villages (1,200 families) located in its precincts. Freshwater fish is a vital protein and source of income for these communities; the